

228-6.

KANSAS CITY STRUCTURAL STEEL COMPANY

W. H. H. H.
OIL TANK
AND
REFINERY EQUIPMENT

KANSAS CITY, KANSAS

KANSAS CITY
STRUCTURAL STEEL
COMPANY



PLANT OF THE KANSAS CITY STRUCTURAL STEEL COMPANY
Kansas City, Kansas

INTRODUCTORY

The purpose of this book is to impress upon the prospective buyer of refinery equipment, the importance of ordering from adopted "Tank Standards."

Years of experience in the fabrication of this class of work has made possible the adoption of standards that materially reduces the cost of every operation over that of specially designed units. Through standardization stocks are made interchangeable, much waste is eliminated, engineering costs are minimized and early delivery is possible.

It is our policy to carry fifty five, ten and five thousand barrel tanks completely fabricated in stock ready for immediate shipment.

Our well equipped and efficient erection organization has crews available for every field.

Our material warehouse is the largest west of Chicago. All plain material is stored in this warehouse and is thus protected from the elements. Because of this protection, you may rely upon all materials being in first class condition. Our location adjacent to the great Mid-Continent field reduces the time in transit from shop to destination to a minimum.

If your requirements are of a special nature, our engineering service is offered.

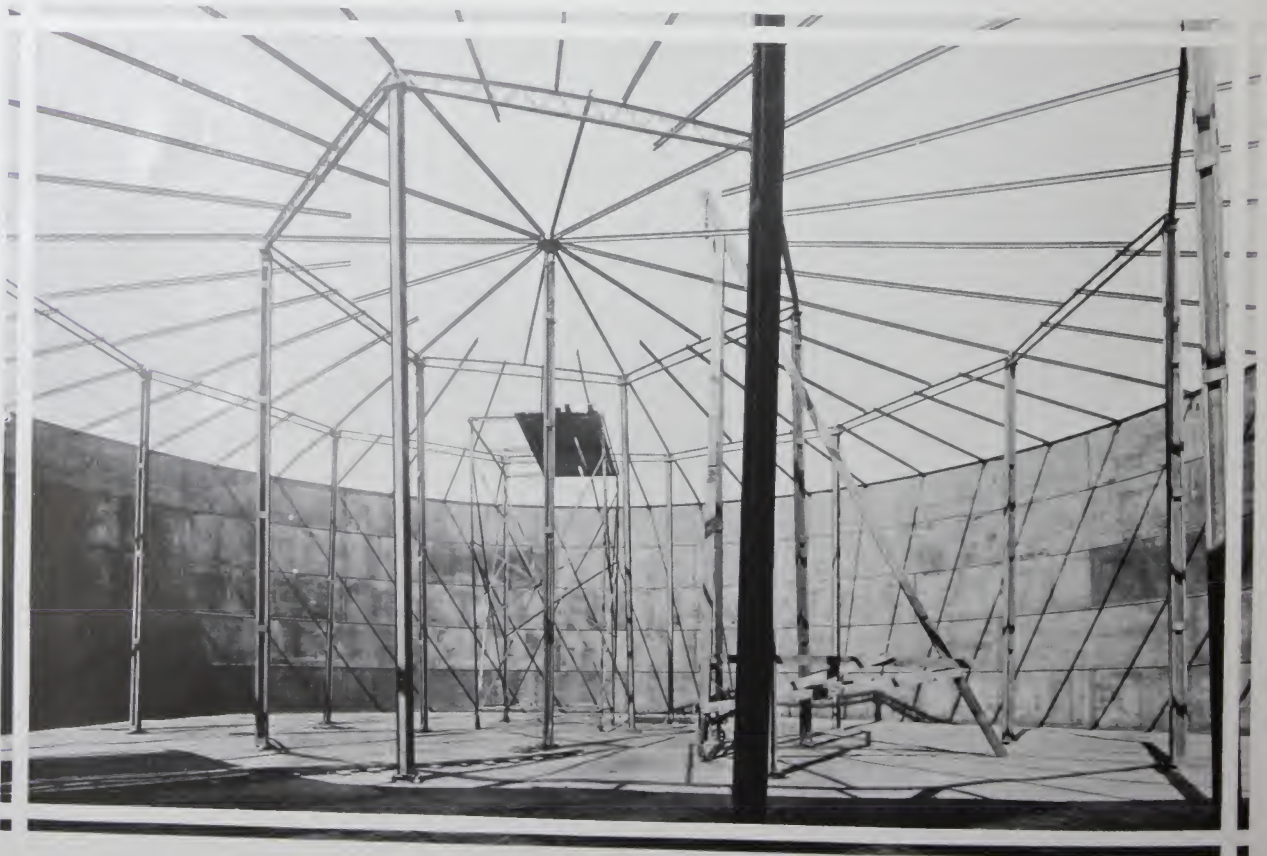
Your inquiries, both large and small, will receive immediate attention.

*Address all communications to our plant
Kansas City, Kansas*

ID 90-31648 711

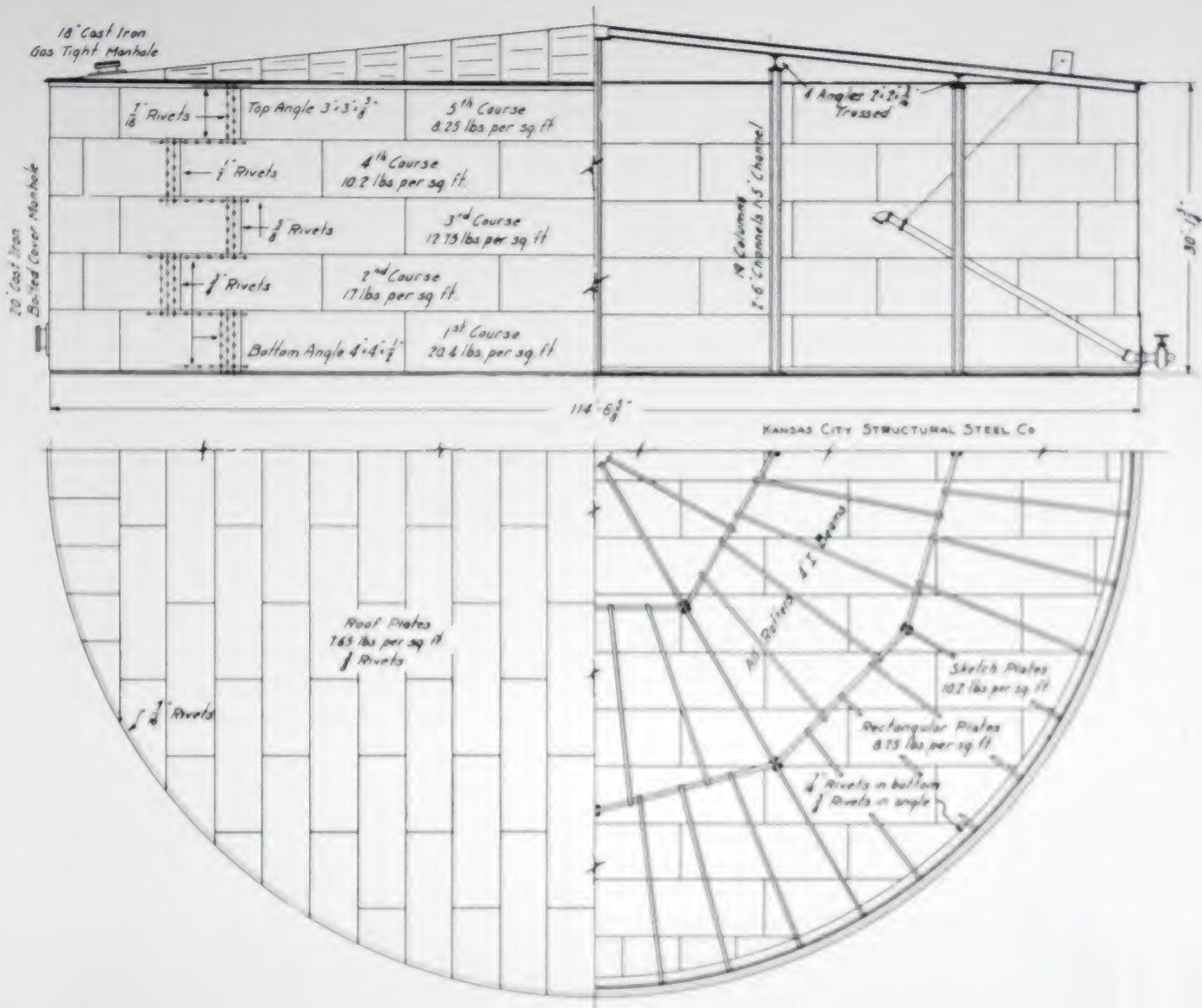


Steel Roof Framing of 55,000 Barrel Tank



Structural Steel Supports 55,000 Barrel Tank

Four



STANDARD 55,000 BARREL TANK

114' 6" x 30'

SPECIFICATIONS

Bottom rect. plates	8.25 lb. sq. ft.
Bottom sketch plates	10.2 lb. sq. ft.
Bottom angle	4" x 4" x 1/2"
1st course plates	20.40 lb. sq. ft.
2nd course plates	17.00 lb. sq. ft.
3rd course plates	12.75 lb. sq. ft.
4th course plates	10.20 lb. sq. ft.
5th course plates	8.25 lb. sq. ft.
Top angle	3" x 3" x 3/8"
Roof plates	7.65 lb. sq. ft.

DIMENSIONS AND CAPACITY

Diameter	114' 6 1/2"
Height	30' 1 1/2"
Capacity	55,192 bbls.
Capacity	2,315,064 gals.

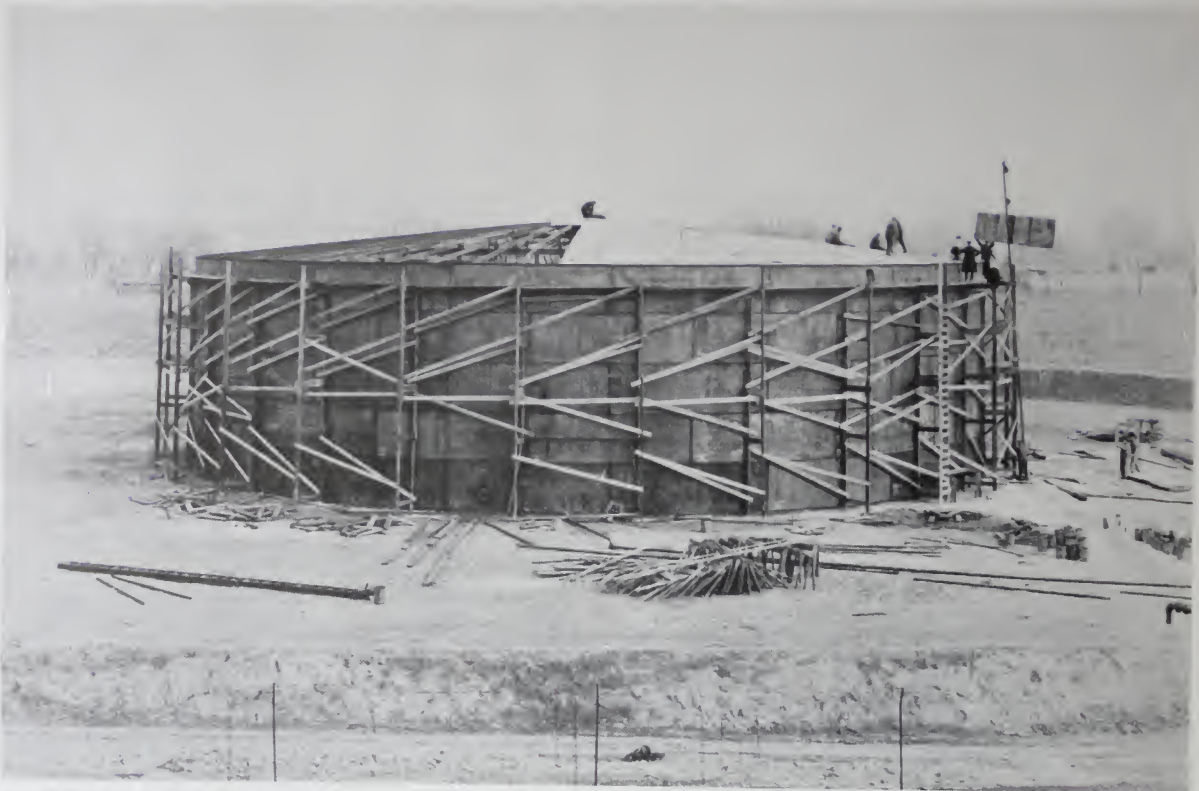
ESTIMATED WEIGHT

Tank complete	400,000 lbs.
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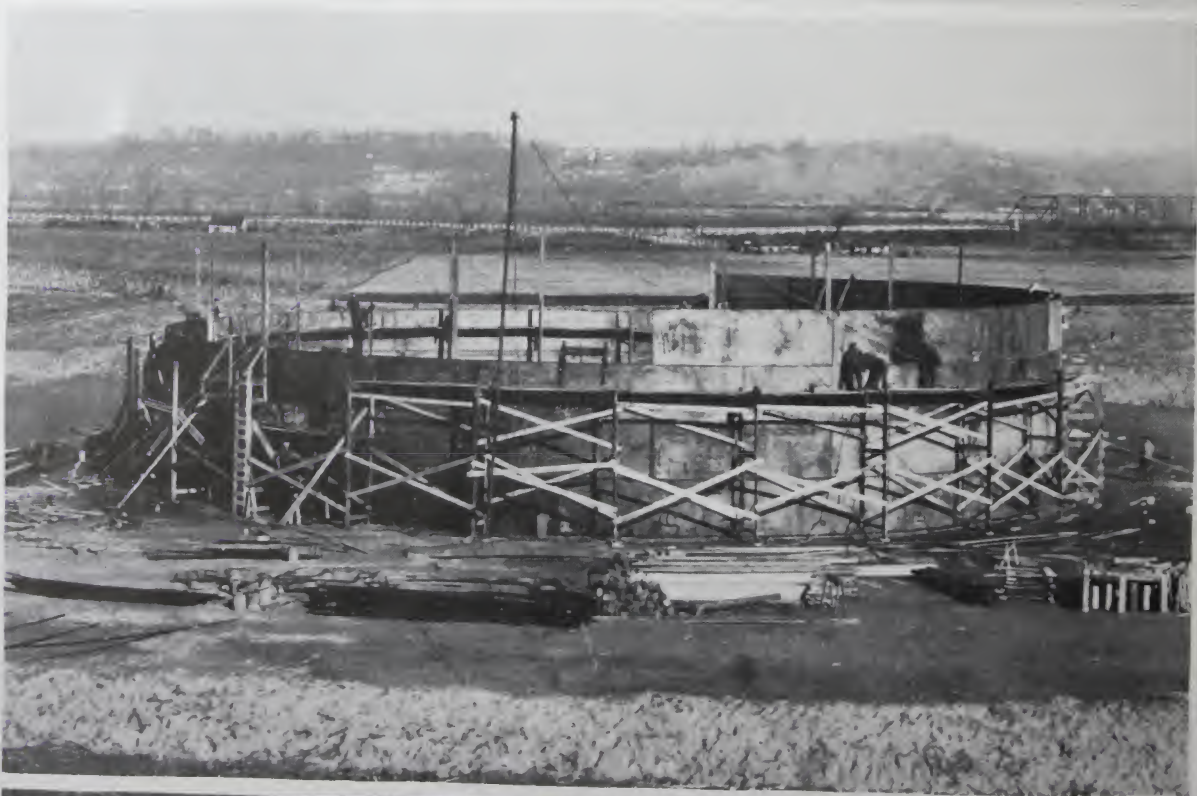
Each Tank furnished with: One steel stair, 8-inch swing pipe, gate valve, windlass box, cable and necessary flanges.

For gas-tight roof top angle is placed on the inside of tank.

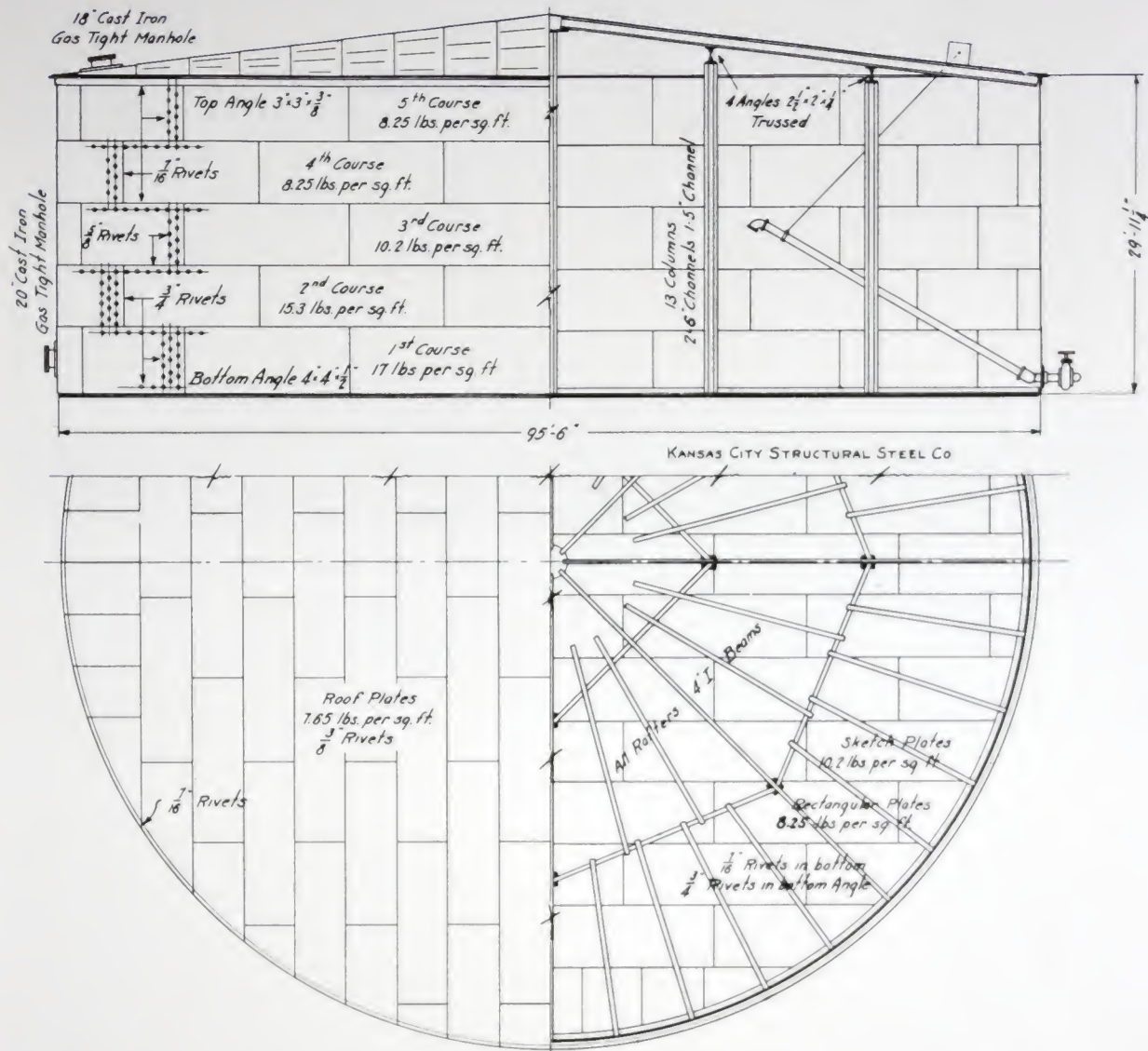
Five



55,000 Barrel Tank Under Construction



Erection of 55,000 Barrel Tank



STANDARD 37,500 BARREL TANK

95' 6" x 30'

SPECIFICATIONS

Bottom rect. plates	8.25 lb. sq. ft.
Bottom sketch plates	10.20 lb. sq. ft.
Bottom angle	$4\frac{1}{2} \times 4\frac{1}{2} \times \frac{1}{2}$
1st course plates	17.00 lb. sq. ft.
2nd course plates	15.30 lb. sq. ft.
3rd course plates	10.20 lb. sq. ft.
4th course plates	8.25 lb. sq. ft.
5th course plates	8.25 lb. sq. ft.
Top angle	$3\frac{1}{2} \times 3\frac{1}{2} \times 3-8$
Roof plates	7.65 lb. sq. ft.

DIMENSIONS AND CAPACITY

Diameter	95' 6"
Height	29' 11 1/4"
Capacity	38,215 bbls.
Capacity	1,605,066 gals.

ESTIMATED WEIGHT

Tank complete	282,400 lbs.
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Each tank furnished with: One steel stair, 8-inch swing pipe, gate valve, windlass box, cable and necessary flanges.

For gas-tight roof top angle is placed on the inside of tank.

Seven



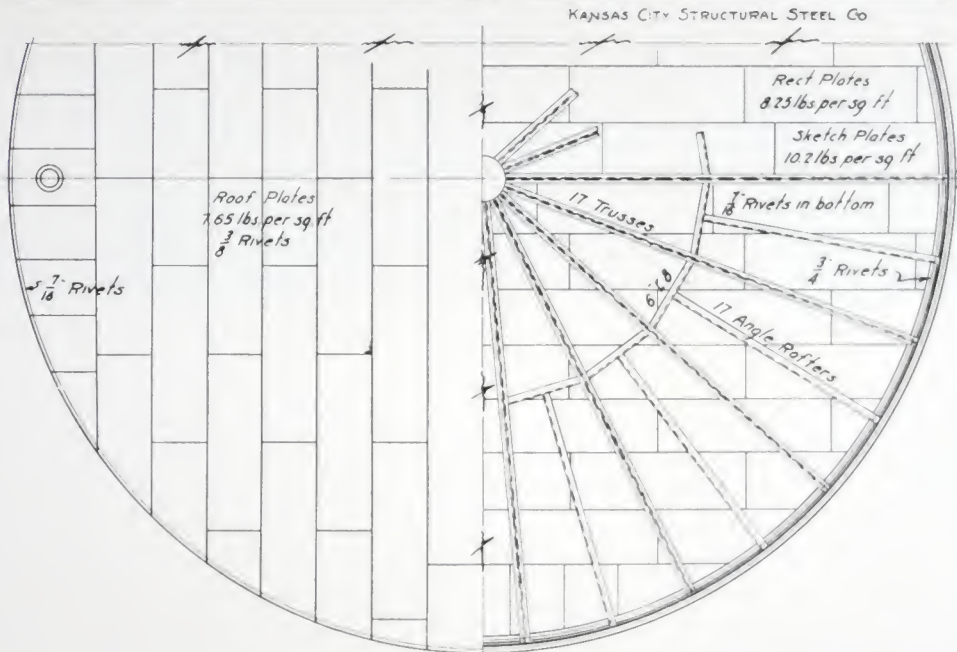
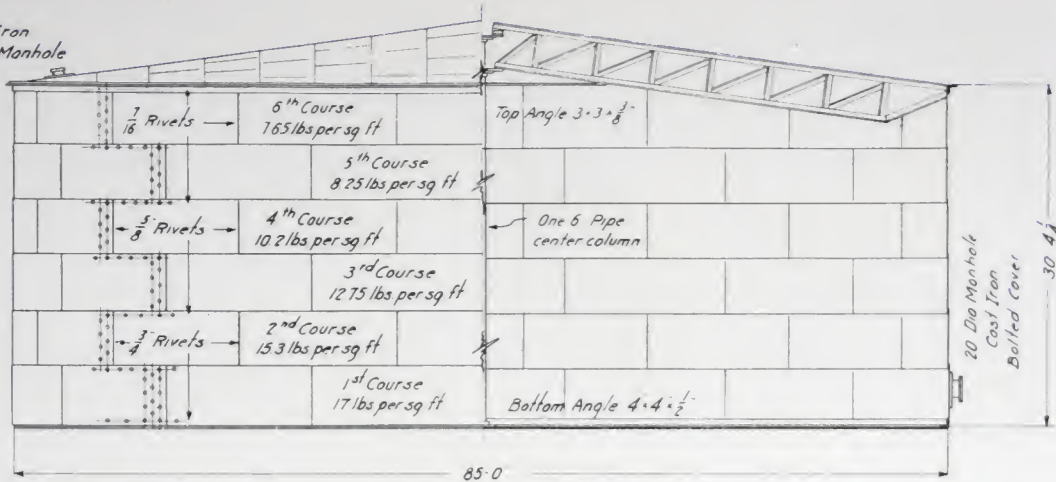
Bottom and First Ring 55,000 Barrel Tank



Erection of First Ring 55,000 Barrel Tank

Eight

18" Cast Iron
Gas Tight Manhole



STANDARD 30,000 BARREL TANK

85 X 30

SPECIFICATIONS

Bottom Rectangular Plates.....	8.25 lbs. sq. ft.
Bottom Sketch Plates.....	10.2 " " "
Bottom Angle.....	4" x 4" x 1/2"
1st Course Plates.....	17.00 lbs. sq. ft.
2nd " ".....	15.3 " " "
3rd " ".....	12.75 " " "
4th " ".....	10.2 " " "
5th " ".....	8.25 " " "
6th " ".....	7.65 " " "
Top Angle.....	3" x 3" x 3/8"
Roof Plates.....	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

Diameter.....	85'-0"
Height.....	30'-4 1/2"
Capacity.....	30,595 bbls. 1,285,000 gals.

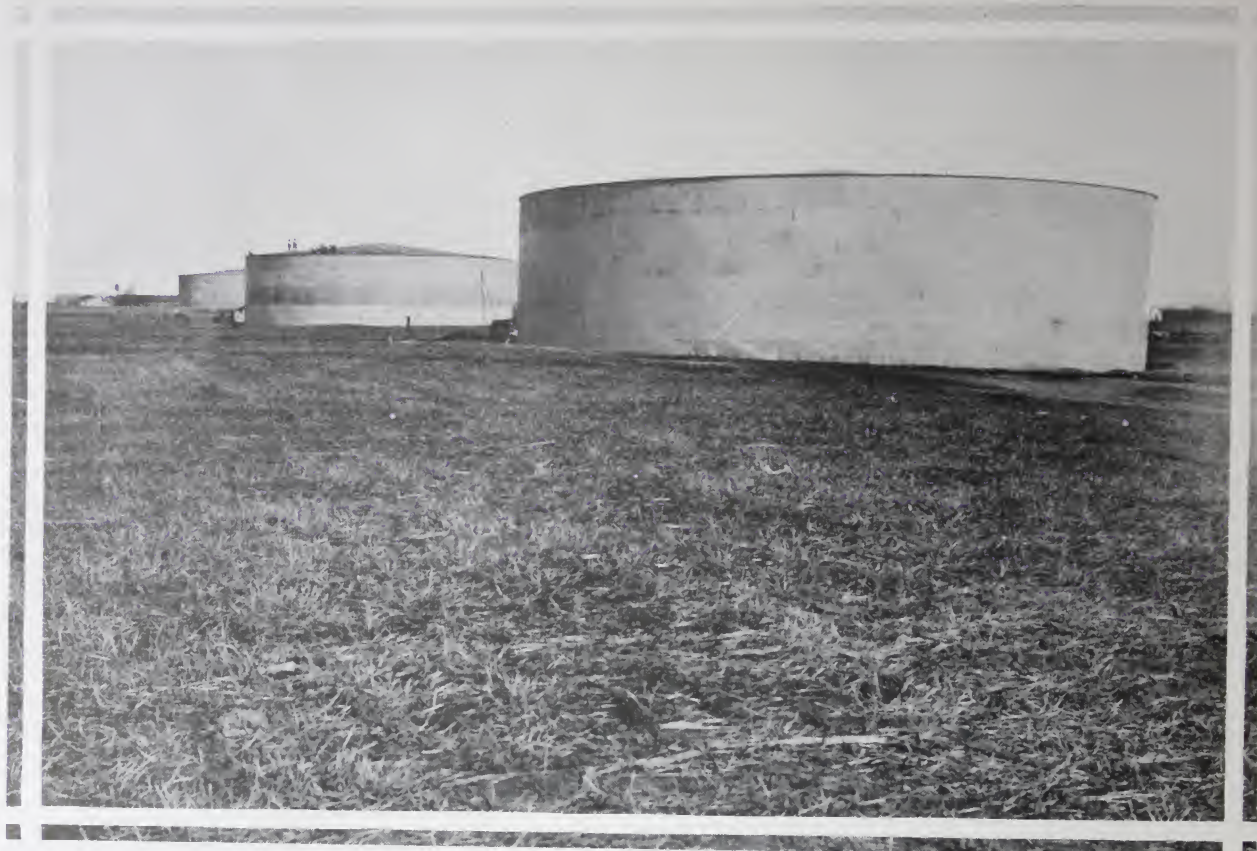
ESTIMATED WEIGHT

Tank complete.....	235,000 lbs.
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Each Tank furnished with one Steel Stair, 8-inch Swing Pipe, Gate Valve, Windlass Box, Cable and Necessary Flanges.

For gas-tight roof top angle is placed on the inside of tank.

Nine

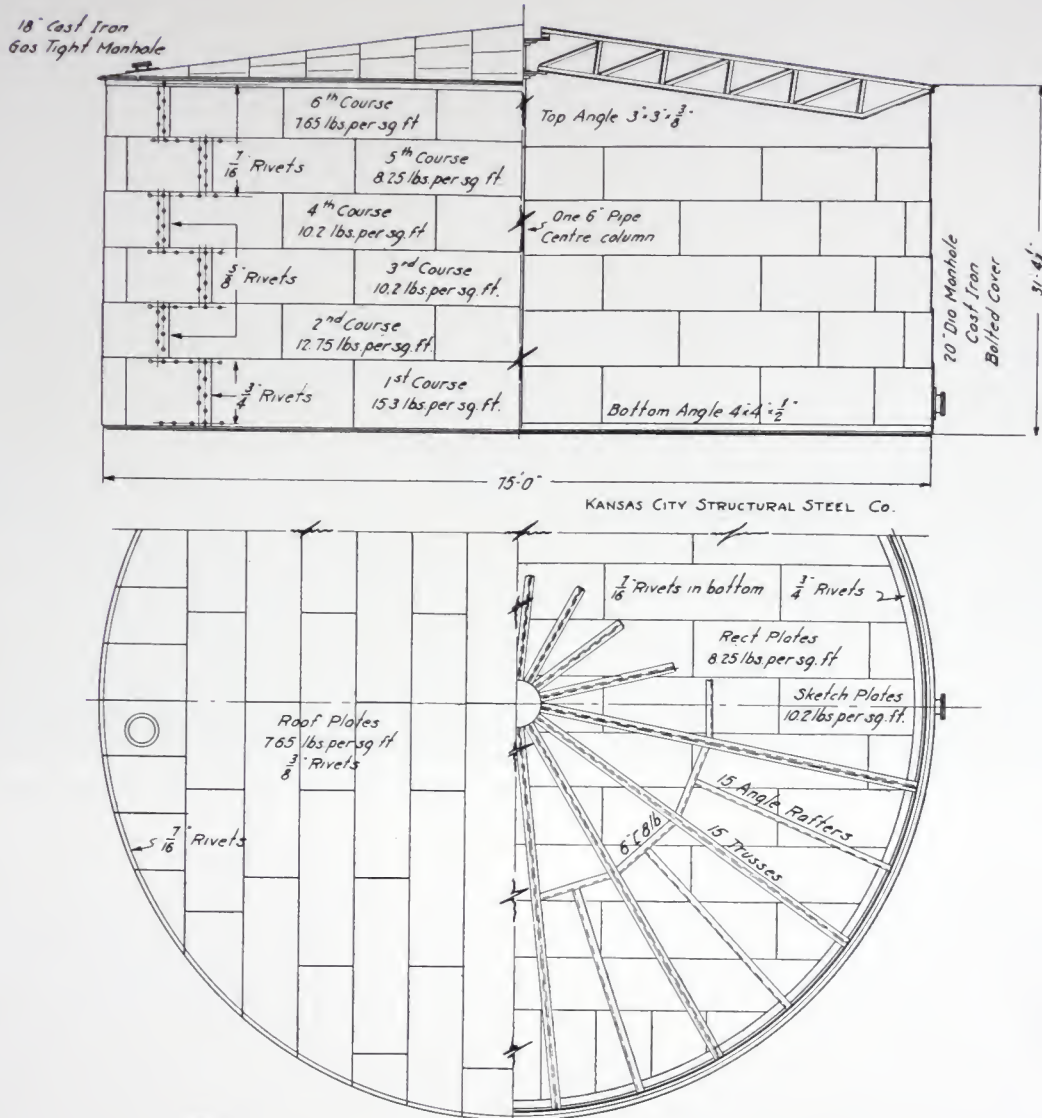


55,000 Barrel Tanks



Two 55,000 Barrel Tanks Completed

Ten



STANDARD 25,000 BARREL TANK

75 x 31

SPECIFICATIONS

Bottom Rectangular Plates.....	8.25 lbs. sq. ft.
Bottom Sketch Plates.....	10.2 lbs. sq. ft.
Bottom Angle.....	4" x 4" x 1/2"
1st Course Plates.....	15.3 lbs. sq. ft.
2nd " ".....	12.75 " "
3rd " ".....	10.2 " "
4th " ".....	10.2 " "
5th " ".....	8.25 " "
6th " ".....	7.65 " "
Top Angle.....	3" x 3" x 3/8"
Roof Plates.....	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

Diameter.....	75'-00"
Height.....	31'-4 1/4"
Capacity.....	24,605 bbls.
".....	1,033,428 gals.

ESTIMATED WEIGHT

Tank complete....	200,600 lbs.
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Each Tank furnished with one Steel Stair, eight-inch Swing Pipe, Gate Valve, Windlass Box, Cable and necessary Flanges.

For gas-tight roof top angle is placed on the inside of tank.

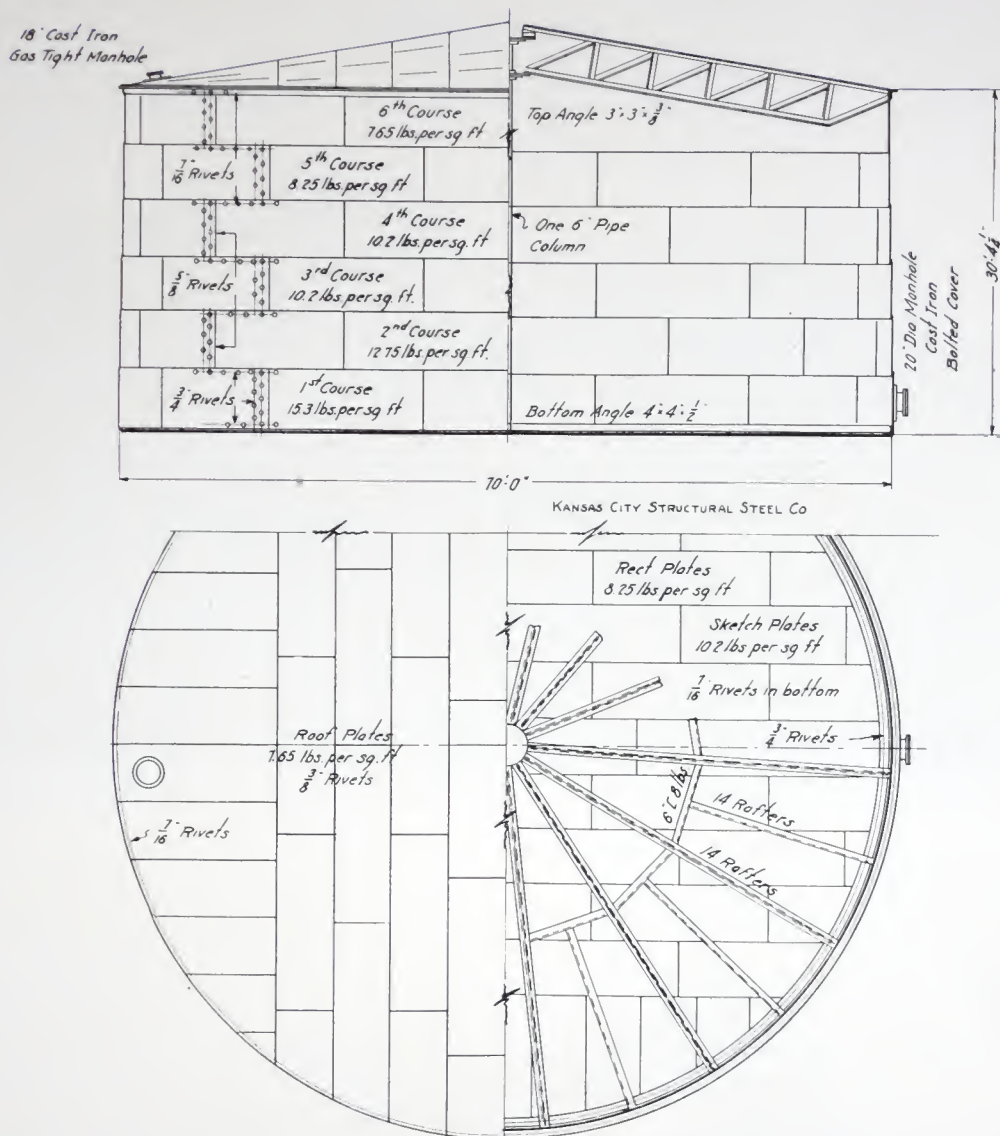
Eleven



Train Load of Our Products



Loading Rack



STANDARD 20,000 BARREL TANK

70 x 30

SPECIFICATIONS

Bottom Rectangular Plates.....	8.25 lbs. sq. ft.
Bottom Sketch Plates.....	10.2 lbs. sq. ft.
Bottom Angle.....	4" x 4" x 1/2"
1st Course Plates.....	15.3 lbs. sq. ft.
2nd " ".....	12.75 " "
3rd " ".....	10.2 " "
4th " ".....	10.2 " "
5th " ".....	8.25 " "
6th " ".....	7.65 " "
Top Angle.....	3" x 3" x 3/8"
Roof Plates.....	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

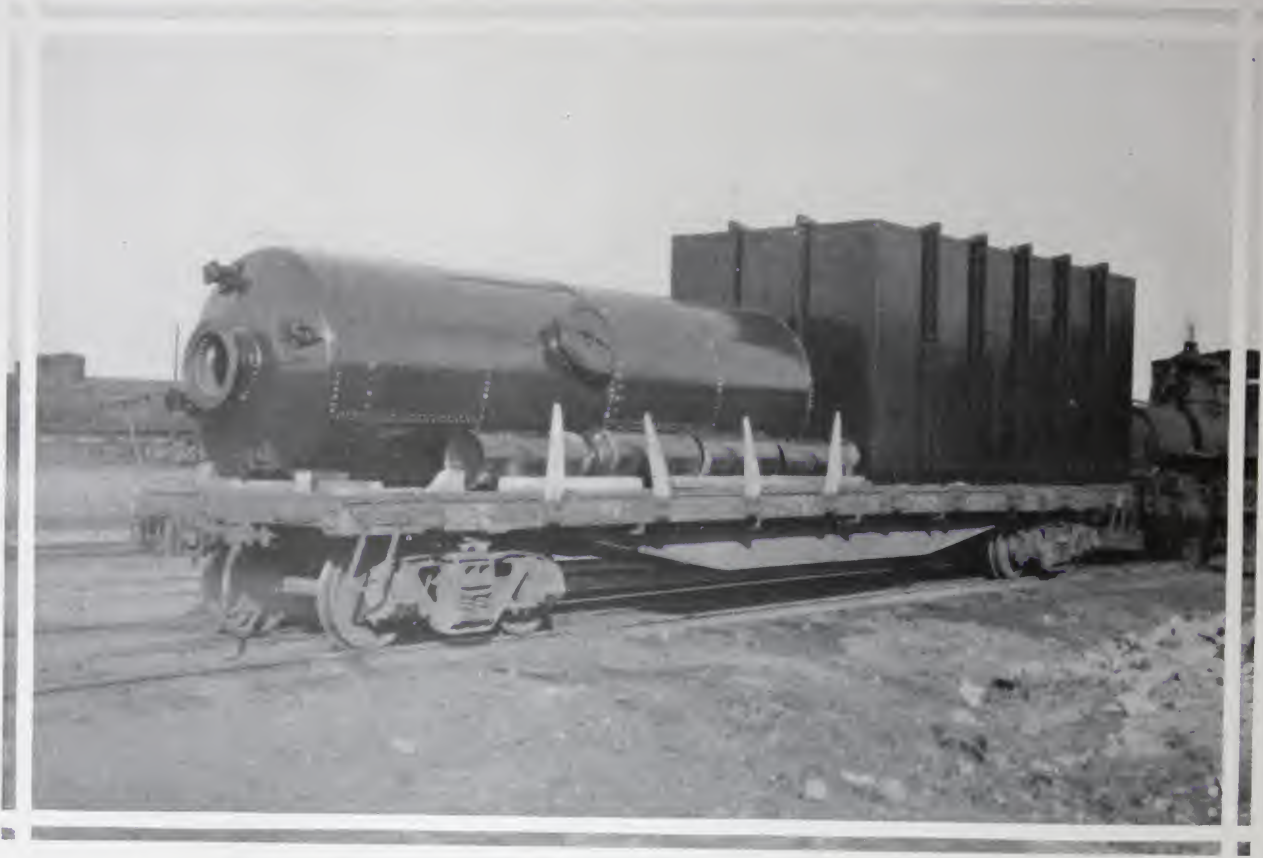
Diameter.....	70'-0"
Height.....	30'-4 1/4"
Capacity.....	20,745 bbls.
".....	871,320 gals.

ESTIMATED WEIGHT

Tank complete.....	179,600
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Each Tank furnished with one Steel Stair, Eight-inch Swing Pipe, Gate Valve, Windlass Box, Cable and necessary Flanges.

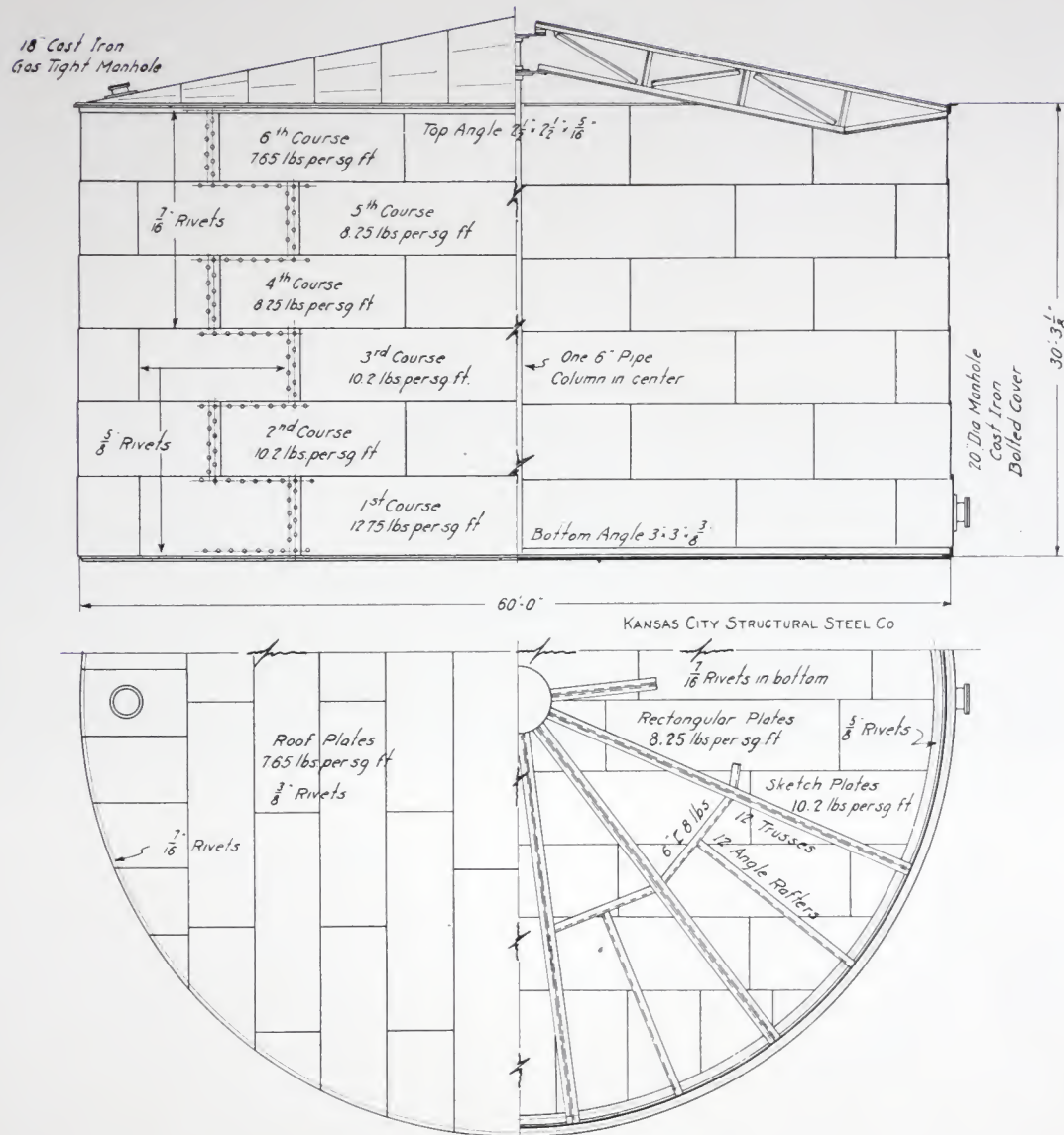
For gas-tight roof top angle is placed on the inside of tank



Vapor Tower and Condenser Box



10 x 20 Acid Tank



STANDARD 15,000 BARREL TANK

60 x 30

SPECIFICATIONS

Bottom Rectangular Plates.....	8.25 lbs. sq. ft.
Bottom Sketch Plates.....	10.2 lbs. sq. ft.
Bottom Angle.....	3" x 3" x $\frac{3}{8}$ "
1st Course Plates.....	12.75 lbs. sq. ft.
2nd " ".....	10.2 " "
3rd " ".....	10.2 " "
4th " ".....	8.25 " "
5th " ".....	8.25 " "
6th " ".....	7.65 " "
Top Angle.....	$2\frac{1}{2}'' \times 2\frac{1}{2}'' \times \frac{5}{16}''$
Roof Plates.....	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

Diameter.....	60'-0"
Height.....	30'- $\frac{3}{8}$ "
Capacity.....	15,207 bbls.
".....	638,714 gals.

ESTIMATED WEIGHT

Tank complete.....	134,000 lbs
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Each Tank furnished with one Steel Stair, Six-inch Swing Pipe, Gate Valve, Windlass Box, Cable and necessary Flanges.

For gas-tight roof top angle is placed on the inside of tank.

Fifteen



10,000 Barrel Tanks

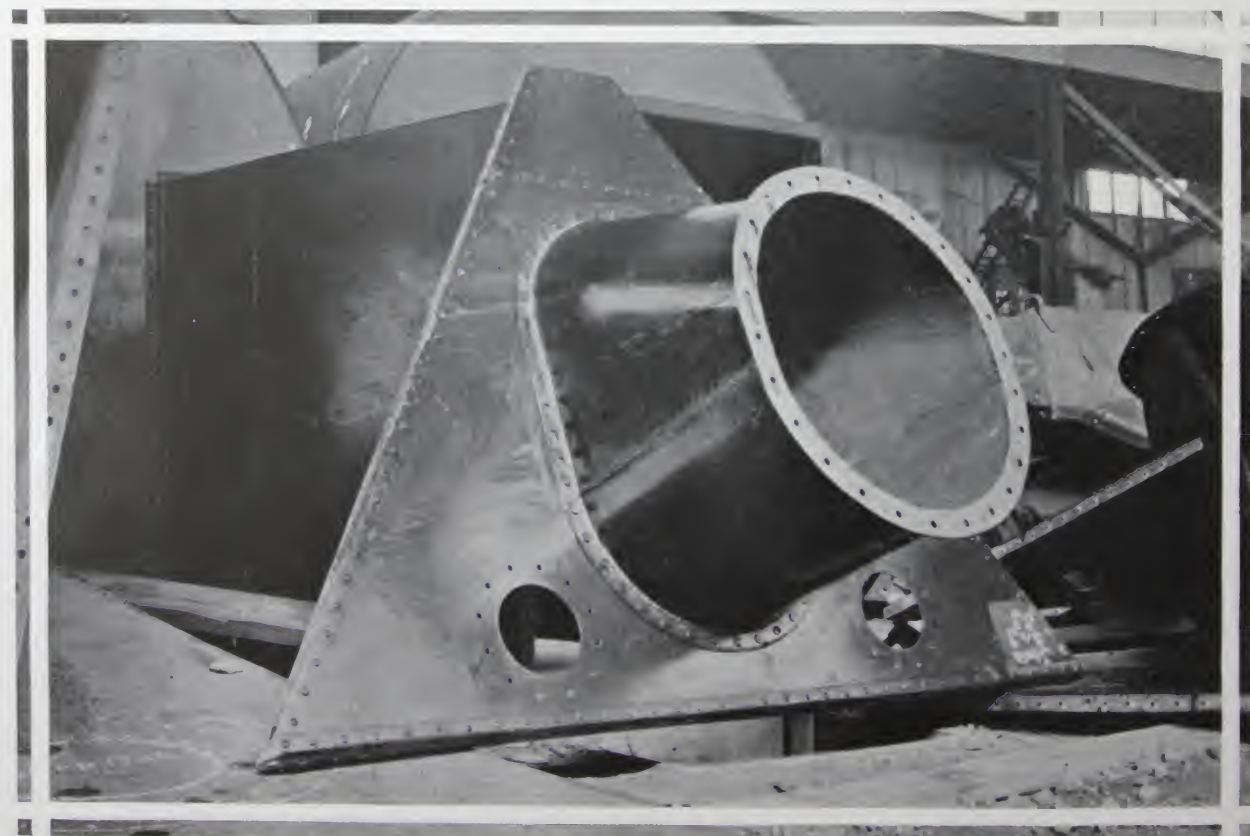


Various Size Storage Tanks

Sutton

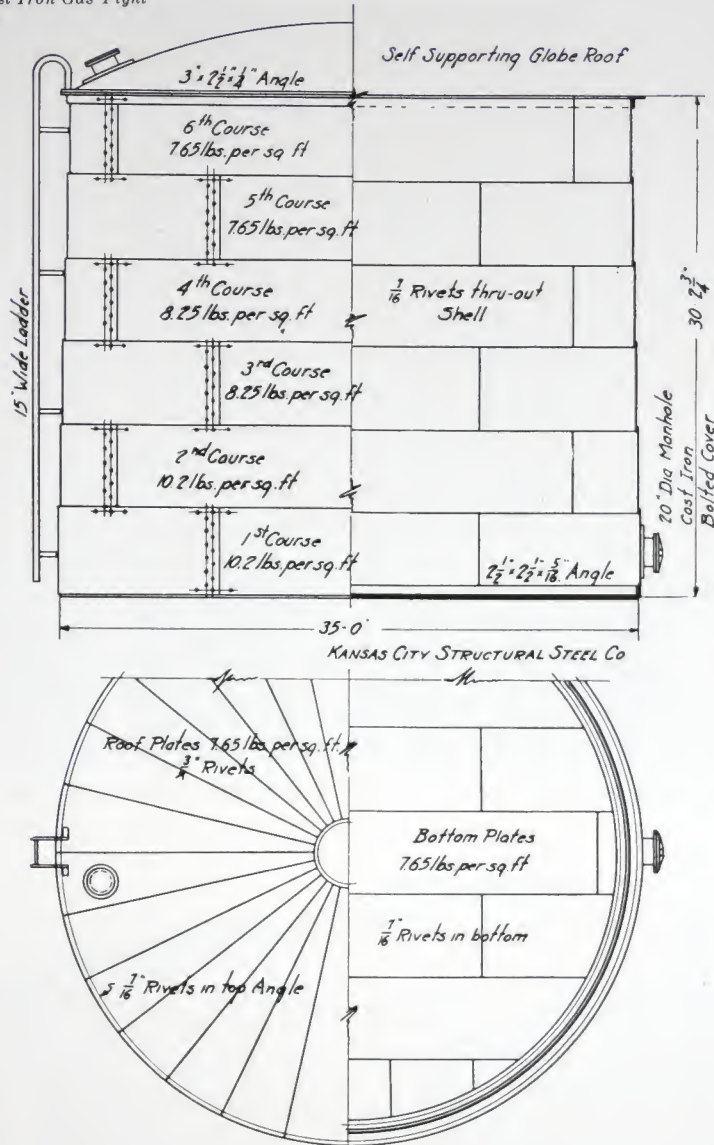


5000 Barrel Tank, 35 x 30



Miscellaneous Plate Work

18-in Cast Iron Gas Tight Manhole



STANDARD 5,000 BARREL TANK

35 x 30

SPECIFICATIONS

Bottom Plates.....	7.65 lbs. sq. ft.
Bottom Angle.....	2 1/2" x 2 1/2" x 5-16"
1st Course Plates.....	10.2 lbs. sq. ft.
2nd " ".....	10.2 " "
3rd " ".....	8.25 " "
4th " ".....	8.25 " "
5th " ".....	7.65 " "
6th " ".....	7.65 " "

DIMENSIONS AND CAPACITY

Diameter.....	35'-0"
Height.....	30'-2 3/4"
Capacity.....	5,154 bbls.
" ".....	216,495 gals.

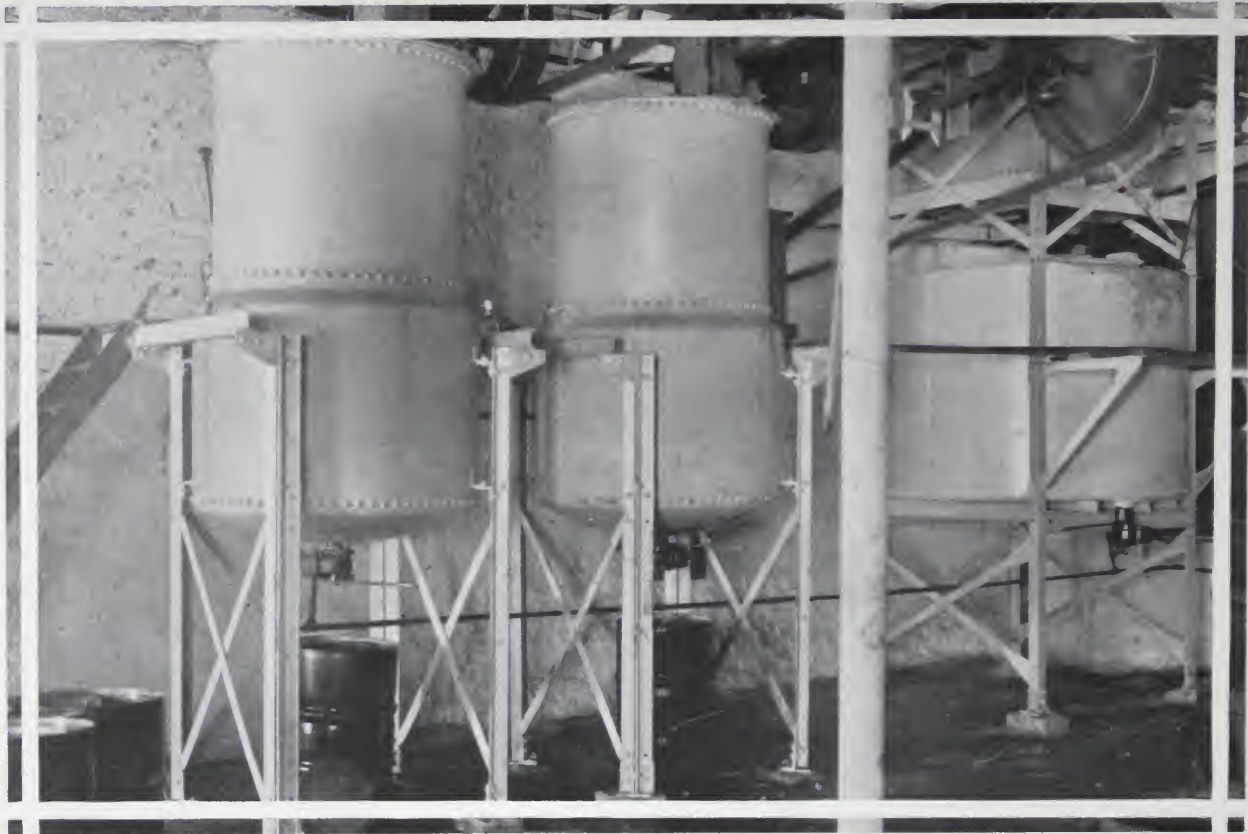
ESTIMATED WEIGHT

Tank complete.....	53,600 lbs.
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Each Tank furnished with One Outside Ladder and necessary Flanges.

For gas-tight roof top angle is placed on the inside of tank.

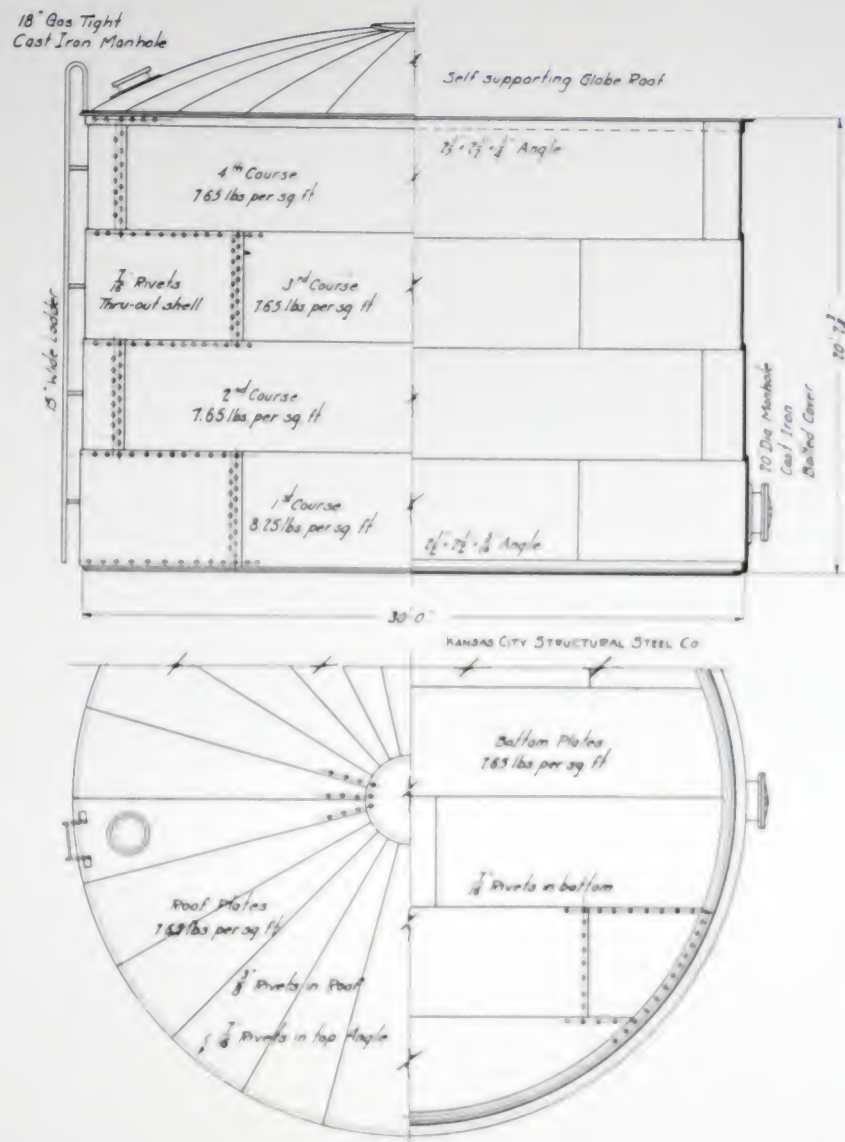
Nineteen



Equipment for Making Lubricating Greases



Blow Cases and Acid Tanks



STANDARD 2,500 BARREL TANK

30 x 20

SPECIFICATIONS			DIMENSIONS AND CAPACITY	
Bottom Plates	7.65 lbs. sq. ft.		Diameter	30'-0"
Bottom Angle	2 1/2" x 2 1/2" x 5-16"		Height	20'-2 1/4"
1st Course Plates	8.25 lbs. sq. ft.		Capacity	2,538 bbls.
2nd " "	7.65 " "			106,630 gals.
3rd " "	7.65 " "			
4th " "	7.65 " "			
Top Angle	2 1/2" x 2 1/2" x 5-16"		ESTIMATED WEIGHT	
Roof Plates	7.65 lbs. sq. ft.		Tank complete	32,600 lbs.

Each Tank furnished with One Outside Ladder and necessary Flanges.

For gas-tight roof top angle is placed on the inside of tank.

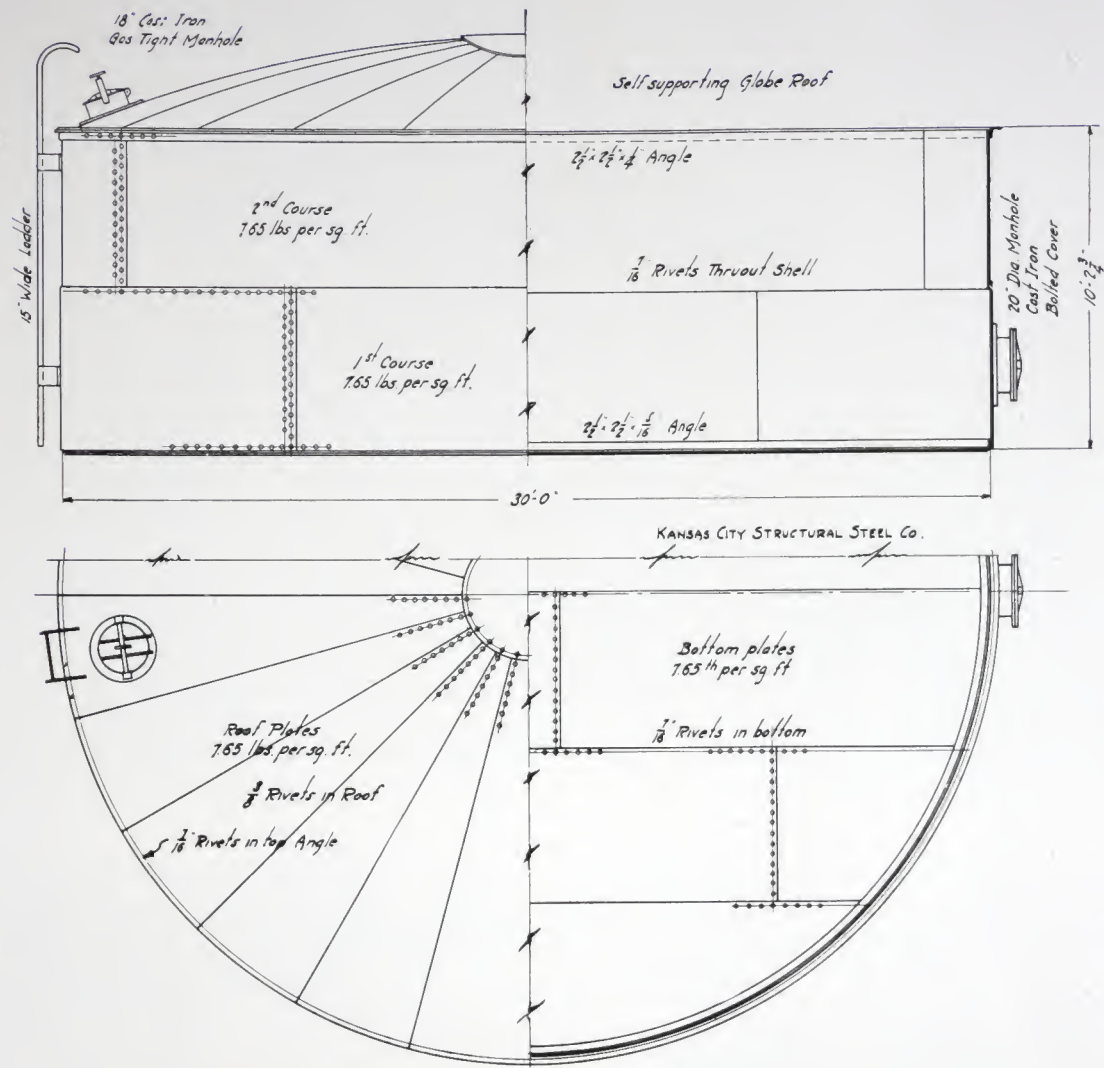
Twenty-One



Bleacher Tanks



1250 Barrel Rundown Tanks, 30 x 10



STANDARD 1,250 BARREL TANK

30 x 10

SPECIFICATIONS

Bottom Plates.....	7.65 lbs. sq. ft.
Bottom Angle.....	2 1/2" x 2 1/2" x 1/16"
1st Course Plates.....	7.65 lbs. sq. ft.
2nd " ".....	7.65 " "
Top Angle.....	2 1/2" x 2 1/2" x 1/4"
Roof Plates.....	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

Diameter.....	30'-0"
Height.....	10'-2 3/4"
Capacity.....	1,286 bbls.
".....	54,033 gals.

ESTIMATED WEIGHT

Tank complete.....	24,000 lbs
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Each Tank furnished with one Outside Ladder and necessary Flanges.

For gas-tight roof top angle is placed on the inside of tank.

Twenty-Three

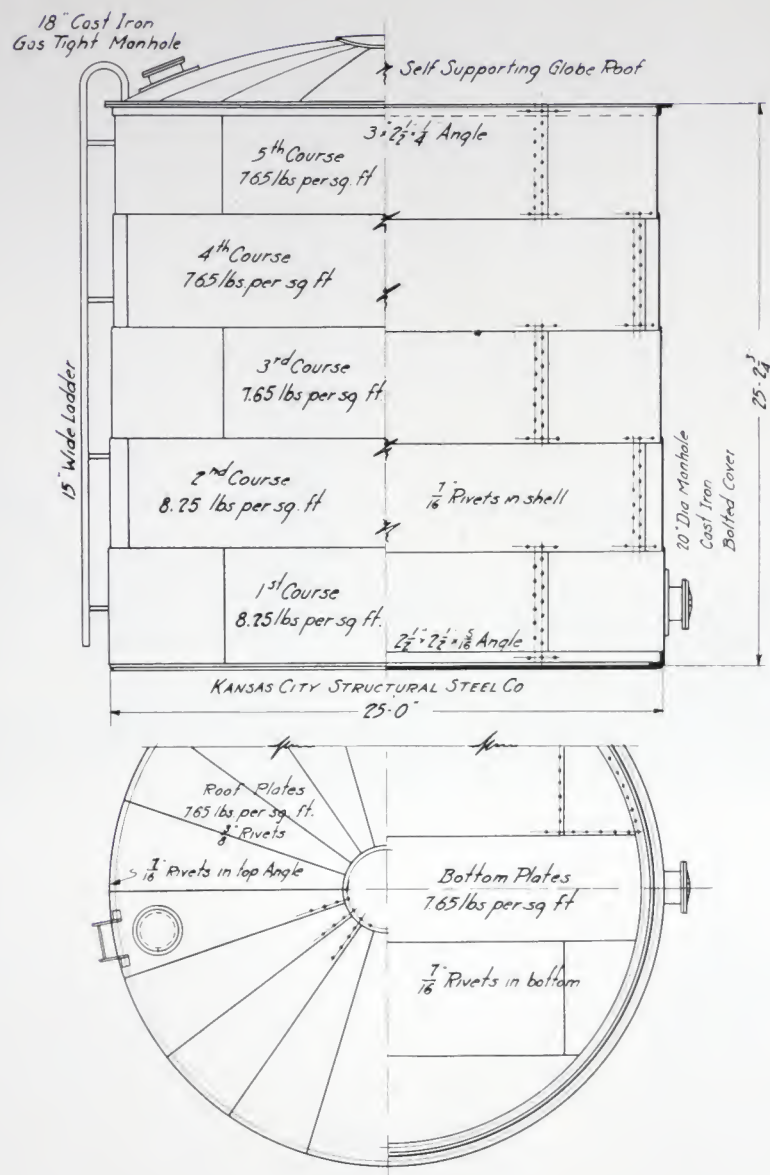


Condenser Boxes



8 x 8 x 24 Condenser Box

Twenty-Four



STANDARD 2,000 BARREL TANK

25 X 25

SPECIFICATIONS

Bottom Plates.....	7.65 lbs. sq. ft.
Bottom Angle.....	2 1/2" x 2 1/2" x 5/16"
1st Course Plates.....	8.25 lbs. sq. ft.
2nd " ".....	8.25 " " "
3rd " ".....	7.65 " " "
4th " ".....	7.65 " " "
5th " ".....	7.65 " " "
Top Angle.....	3" x 2 1/2" x 1/4"
Roof Plates.....	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

Diameter.....	25'-0"
Height.....	25'-2 3/4"
Capacity.....	2,191 bbls.
	92,045 gals.

ESTIMATED WEIGHT

Tank complete.....	29,000 lbs.
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Each Tank furnished with one Outside Ladder and necessary Flanges.

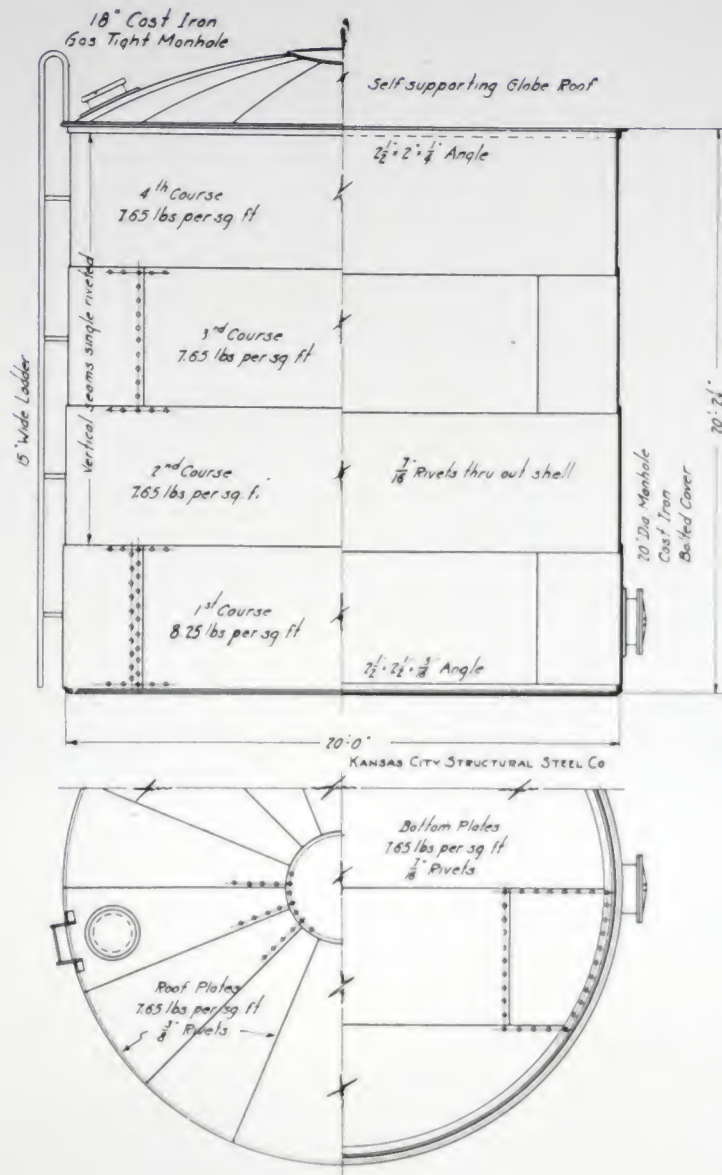
For gas-tight roof top angle is placed on the inside of tank.



Vapor Towers



Vapor Towers and Supports



STANDARD 1,000 BARREL TANK

20 X 20

SPECIFICATIONS

Bottom Plates.....	7.65 lbs. sq. ft.
Bottom Angle.....	2 1/2" x 2 1/2" x 5/16"
1st Course Plates.....	8.25 lbs. sq. ft.
2nd " ".....	7.65 " "
3rd " ".....	7.65 " "
4th " ".....	7.65 " "
Top Angle.....	2 1/2" x 2" x 1/4"
Roof Plates.....	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

Diameter.....	20'-0"
Height.....	20'-2 1/2"
Capacity.....	1,125 bbls.
	47,268 gals.

ESTIMATED WEIGHT

Tank complete.....	18,600 lbs.
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Each Tank furnished with one Outside Ladder and necessary Flanges.

For gas-tight roof top angle is placed on the inside of tank.

Twenty-Seven



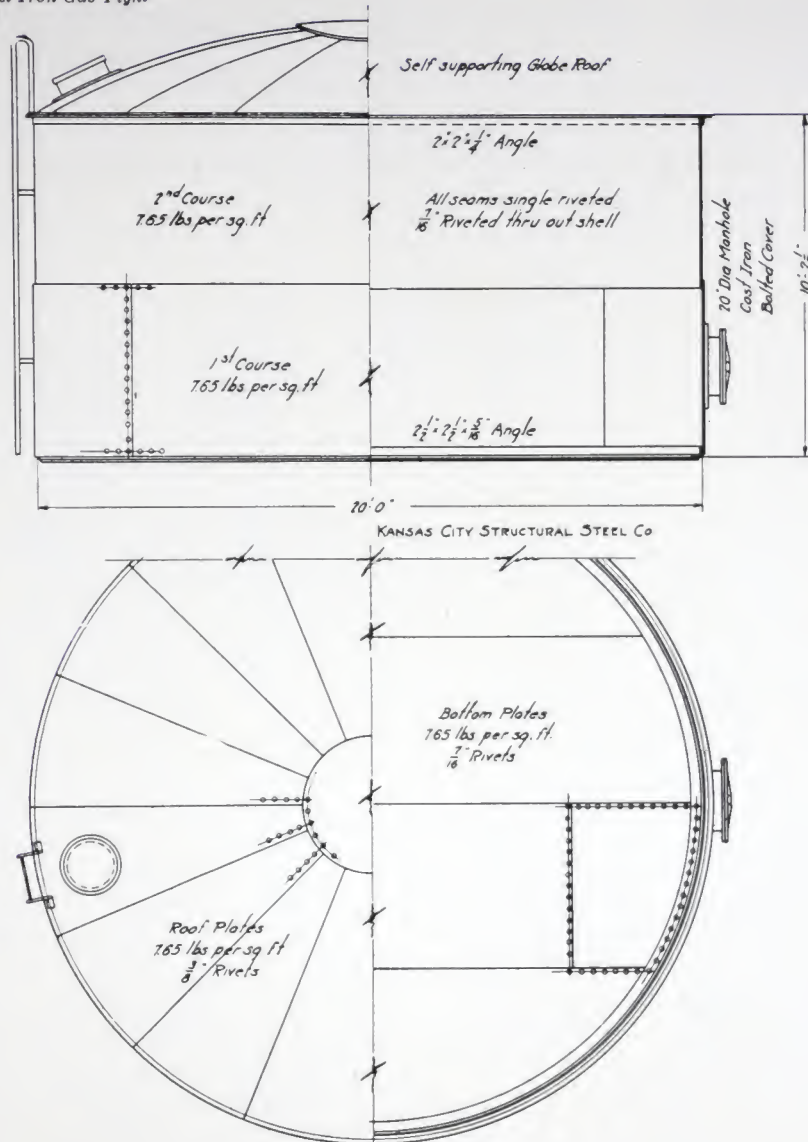
10,000 Gallon Tank Cars Complete for Shipment



10,000 Gallon Tank Car

Twenty-Eight

18-in Cast Iron Gas Tight
Manhole



STANDARD 500 BARREL TANK

20 X 10

SPECIFICATIONS

Bottom Plates.....	7.65 lbs. sq. ft.
Bottom Angle.....	2 1/2" x 2 1/2" x 5/16"
1st Course Plates.....	7.65 lbs. sq. ft.
2nd " ".....	7.65 " "
Top Angle.....	2" x 2" x 1/4"
Roof Plates.....	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

Diameter.....	10'-0"
Height.....	10'-2 1/2"
Capacity.....	570 bbls.
".....	23,952 gals.

ESTIMATED WEIGHT

Tank complete.....	13,000 lbs.
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Each Tank furnished with one Outside Ladder and necessary Flanges.

For gas-tight roof top angle is placed on the inside of tank.

Twenty-Nine

SATISFIED CUSTOMER BEST ADVERTISEMENT

Among our valued customers in the oil industry
are the following:

Alamo Oil & Refining Co.	Mexican Gulf Oil Company
Amarillo Oil & Refining Co.	Mexican Petroleum Corporation of Louisiana
Amerado Petroleum Corporation	Mid-Co Gasoline Company
American Gasoline Corporation	Mid-Co Petroleum Company
Arro Oil & Refining Co.	Midland Refining Co.
Atlantic Oil Products Co.	Midwest Refining Company
Banker's Petroleum & Refining Co.	Mutual Oil Company
Beacon Refining Company	National Petroleum Company of Mexico
Barnsdall Refining Co.	National Refining Company
Caddo Central Oil & Refining Co.	Oklahoma Petroleum & Gas Co.
Champlin Refining Co.	Panther City Oil & Refining Co.
Chas. F. Noble Oil & Gas Co.	Penn Lubric Oil Company
Coline Oil Company	Pierce Oil Corporation
Constantin Refining Company	Pioneer Oil Company
Cooper & Henderson Oil Co.	Pioneer Oil & Refining Co.
Cosden & Company	Prairie Oil & Gas Company
Cumberland Oil & Gas Co.	Prairie Pipe Line
Diamond Gasoline Co.	Producers Refining Company
Dublin Oil & Refining Co.	Pure Oil Company
Eldorado Refining Company	Red River Refining Co.
Elliott Jones & Co., Inc.	Rio Bravo Oil Company
Empire Refineries, Inc.	Roxana Petroleum Corporation
Export Oil Corporation	Sapulpa Refining Company
Fairmont Refining Company	Shaffer Oil & Refining Co.
Federal Oil & Refining Co.	Shell Company of California
Ford Oil & Refining Co.	Shreveport Producing & Refining Corporation
Four States Refining Company	Sinclair Cuba Oil Company
Gates Oil Company	Sinclair Refining Company
Gate City Oil & Refining Co.	Southern Oil Corporation
Globe Oil & Refining Co.	Standard Oil Company of Indiana
Grayburgh Oil Company	Standard Oil Company of Louisiana
Great Southern Producing & Refining Co.	Standard Oil Company of Nebraska
H. & H. Refining Company	Texas Oil Products Company
Healdton Oil & Gas Co.	Texas Ranger Producing & Refining Co.
H. F. Willcox Oil & Gas Co.	The Eldorado Refining Co.
Home Oil & Refining Co.	The Kanotex Refining Company
Home Oil Company	The Midwest Refining Company
Humble Oil & Refining Co.	The Osage Gasoline Company
Imperial Refining Co.	The Pure Oil Company
Indiahoma Refining Company	The Texas Company
International Oil & Gas Corporation	Tidal Gasoline Company
Kansas Oil & Refining Co.	Trans-Alantic Petroleum Co.
K. O. T. Oil & Refining Co.	Union Petroleum Company
Lawton Refining Company	U. S. Tex Oil Corporation
Lawton Star Refining Company	Utah Oil Refining Company
Livingston Refiners Corporation	Wentz & McCaskey Gasoline Co.
Louisiana Oil Refining Co.	White Eagle Oil & Refining Co.
Marland Refining Co.	



Alaska-Gasteneau Mining Co., Jeneau, Alaska



SKYLINE OF KANSAS

The steel for the buildings shown in tint was manufactured

- | | |
|--|-------------------------------------|
| 1 Garden Theatre | 11 Regent Theatre |
| 2 The Kansas City Star Building | 12 Jones Store Co. Building |
| 3 Pantages Theatre | 13 K. C. Power & Light Co. Building |
| 4 Halpin-Moore Building | 14 Oppenstein Building |
| 5 Power House, Union Station | 15 Kansas City Club Building |
| 6 B-R Electric & Telephone Mfg. Co. Building | 16 Boley Building |
| 7 Empress Theatre | 17 S. S. Kresge Co. Building |
| 8 The Schmelzer Co. Bldg. (Remodeled) | 18 Webster Withers Building |
| 9 Globe Theatre | 19 Hotel Dixon |
| 10 J. W. Jenkins' Sons Music Co. Building | 20 Hotel Muehlebach |

Thirty Two



S CITY—MARCH, 1921

ed and erected by the Kansas City Structural Steel Company.

- | | |
|--|--|
| 21 Kline Suit & Cloak Co. Building | 31 Royal Theatre |
| 22 Fred Wolferman Co. Building | 32 Rothschilds & Sons Building |
| 23 Security Building | 33 Gordon & Koppel Clothing Co. Bldg. |
| 24 Geo. B. Peck Dry Goods Co. Building | 34 Republic Building |
| 25 K.C. Athletic Club Building | 35 Gates Building |
| 26 John Taylor Dry Goods Co. Building | 36 Rialto Building |
| 27 Waldheim Building | 37 Reliance Building, (two upper floors) |
| 28 Sharp Building | 38 Grand Avenue Temple Building |
| 29 Bagby & Co. Building | 39 Grand Avenue Church |
| 30 Orear-Leslie Building | |

Thirty-Three



Section of Warehouse

IMMEDIATE STEEL

Our material warehouse is the largest west of Chicago. All material is stored therein and is thus protected from the elements. Because of this protection, you may rely upon the material being received in first class condition.

Our location at Kansas City with railway facilities second to none and our proximity to the Mid-Continent and Gulf Coastal points enable us to reduce the time in transit to a minimum. Our well equipped plant with a capacity of 5,000 tons per month, an average stock of 10,000 tons especially selected to meet the needs of the oil industry, together with location insures prompt shipment and early delivery.

We ship all plain material such as structural shapes, plates, bars, sheets, steel joists, steel sash, metal lathe, floor plates, bolts, rivets, turn buckles, etc., within twenty four hours after receipt of order.

Structural columns, lintels, punched beams, reinforcing rods straight or bent to detail, gas pile columns, etc., are shipped within two to three days after receipt of order.

Our prices are equalized with St. Louis and Chicago.

When your still gives out

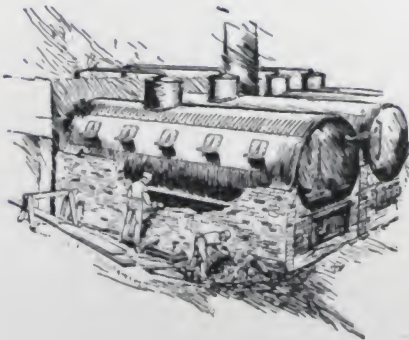
a new bottom plate will be shipped within 48 hours from the time we receive your telegraphed order. Delivery in the minimum time is further assured by our proximity to the oil fields and the splendid railroad facilities available at Kansas City.

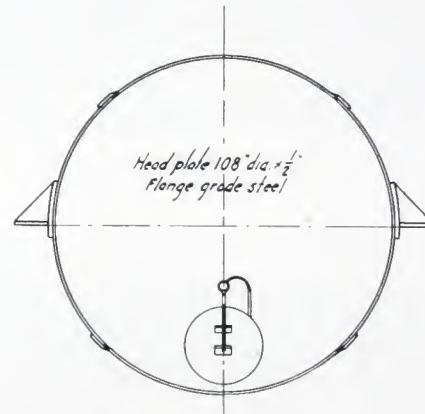
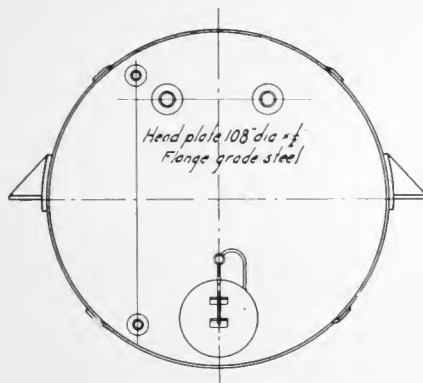
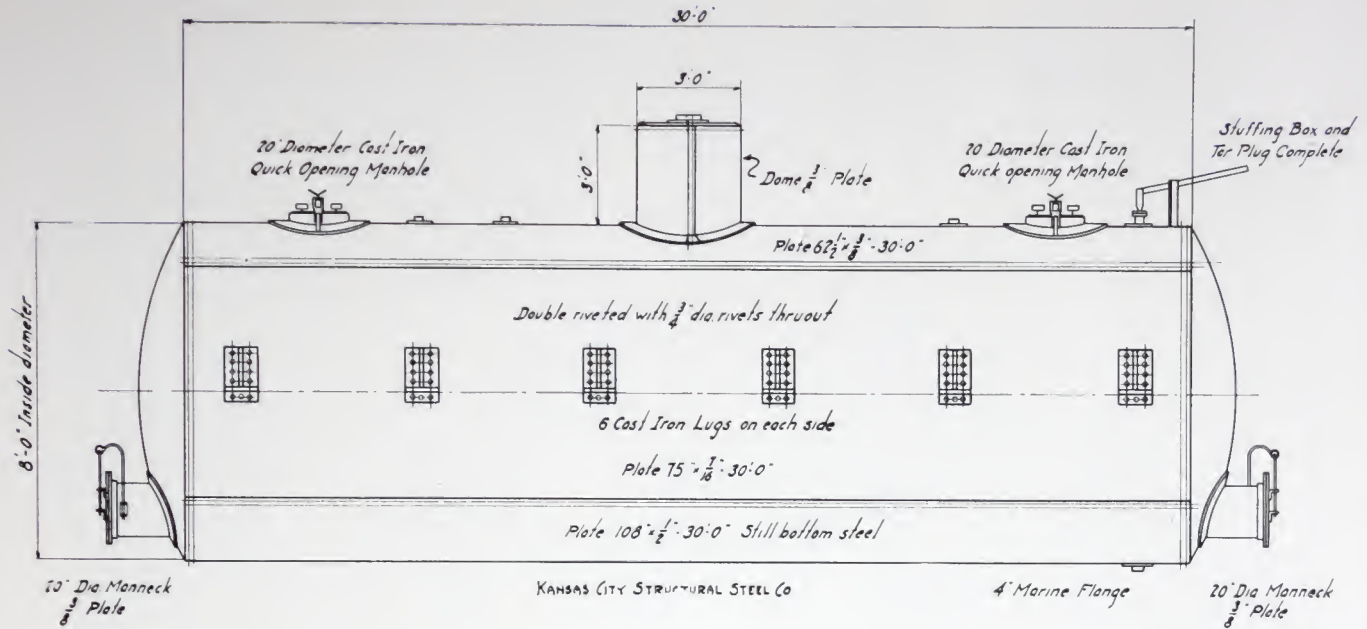
Still Bottom Plates

are delivered rolled to proper radius, bevel sheared; punched if required. The usual stock size is 108x½, length 30' 3½". We always maintain a stock sufficient to meet any requirement. It will facilitate delivery to specify the radius, size, and length in order.

Kansas City Structural Steel Company

Kansas City, U. S. A.





STANDARD FIRE STILL

8 x 30

279 Barrels Actual Capacity

SPECIFICATIONS

Bottom Plate (Still Bottom Steel)	108" x 1/2"
Lug Plate	7/16"
Top Plate	3/8"
One-Piece Heads	1/2" Flange Steel
Estimated Weight	22,600 lbs.

Still is riveted up complete in our shop and tested to twenty-five pounds Hydrostatic pressure, and given one coat of paint before shipping. Seams are double riveted throughout with 3/4-inch diameter rivets. Fittings include cast iron lugs, one 36-inch diameter by 36-inch high dome of 3/8-inch plate. Two 20-inch diameter cast iron quick-opening manholes complete. On either front or rear head one 20-inch diameter 3/8-inch plate manneck with bolted cover and crane. A 4-inch diameter cast iron tar plug, with stuffing box and mechanism complete. Necessary Flanges furnished and riveted on in shop as specified by customer.

Thirty-Seven

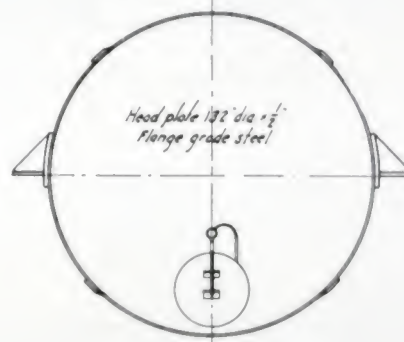
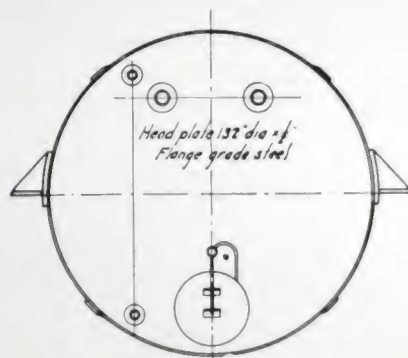
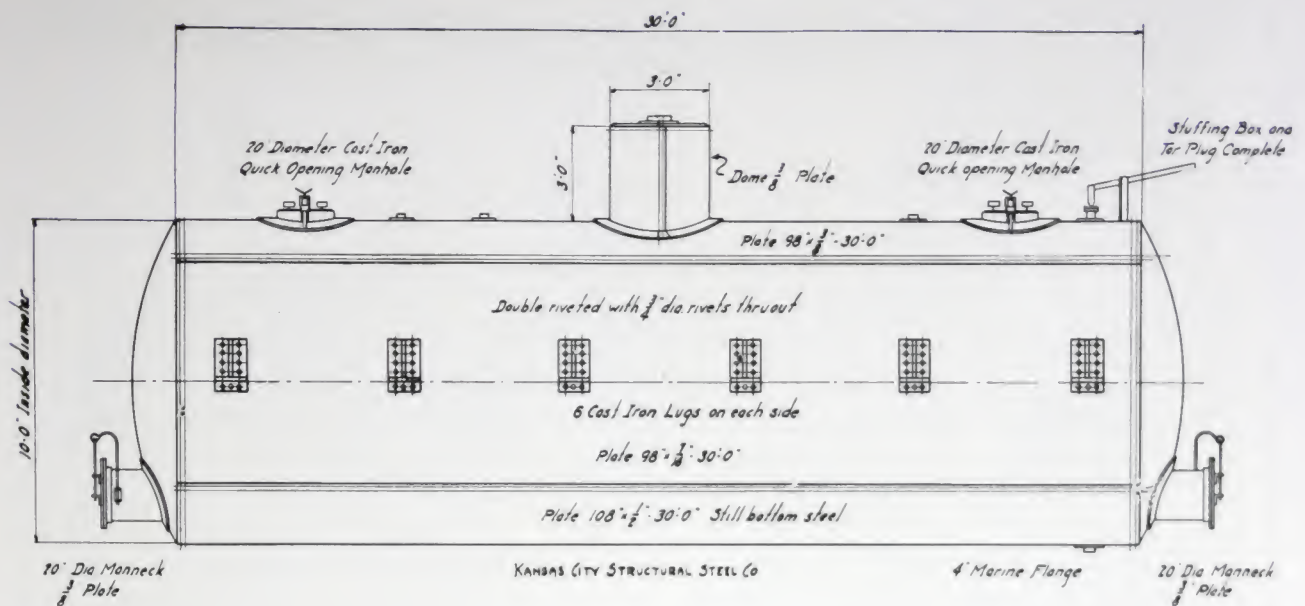


6 x 30 Acid Tank



Thirty-Eight

Interior of Our Riveting Shop



STANDARD FIRE STILL

10 X 30

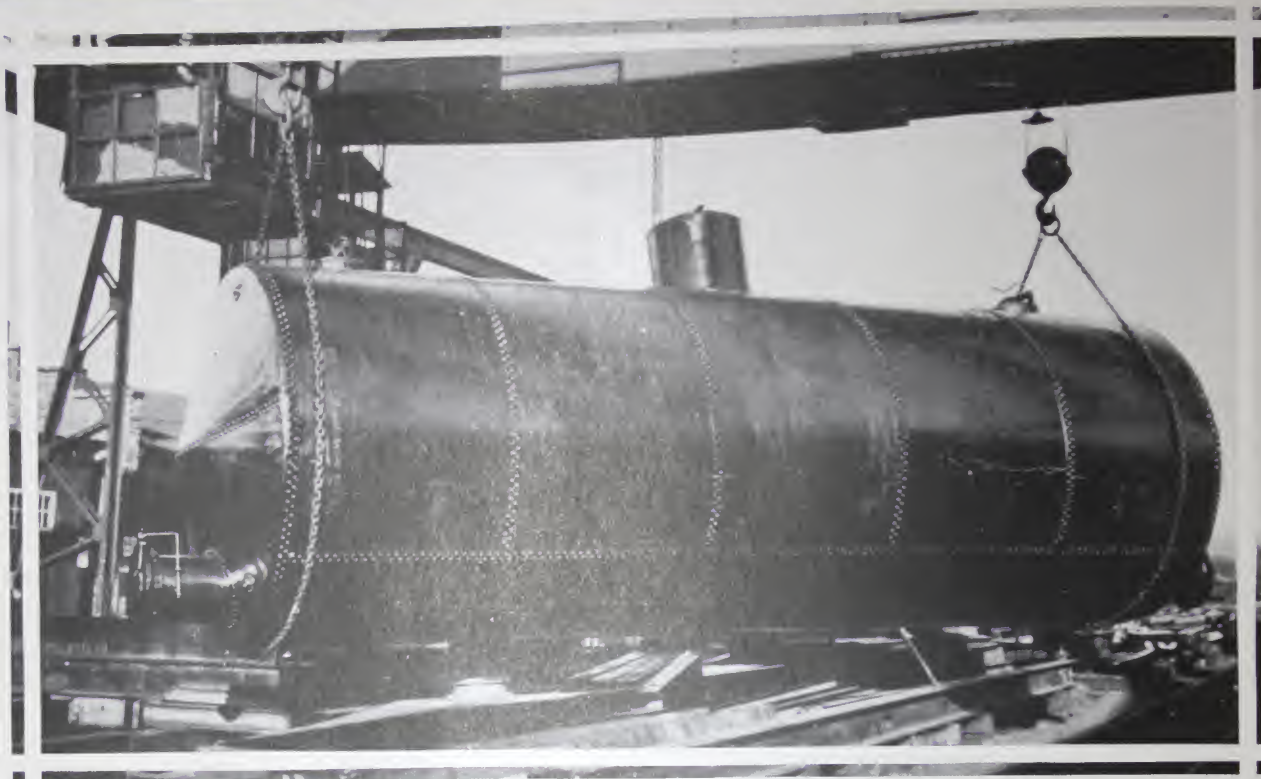
440 Barrels Actual Capacity

SPECIFICATIONS

Bottom Plate (Still Bottom Steel)	108" x 1/2"
Lug Plate	1/8"
Top Plate	3/8"
One-Piece Heads	1/2" Flange Steel
Estimated Weight	29,000 lbs.

Still is riveted up complete in our shop and tested to twenty-five pounds Hydrostatic pressure, and given one coat of paint before shipping. Seams are double riveted throughout with 3/4-inch diameter rivets. Fittings include cast iron lugs, one 36-inch diameter by 36-inch high dome of 3/8-inch plate. Two 20-inch diameter cast iron quick-opening manholes complete. On either front or rear head one 20-inch diameter 3/8-inch plate manneck with bolted cover and crane. A 4-inch diameter cast iron tar plug, with stuffing box and mechanism complete. Necessary Flanges furnished and riveted on in shop as specified by customer.

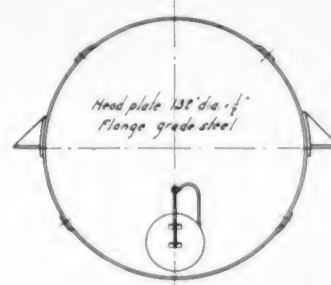
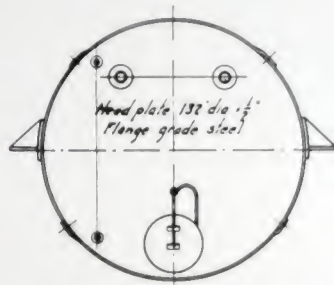
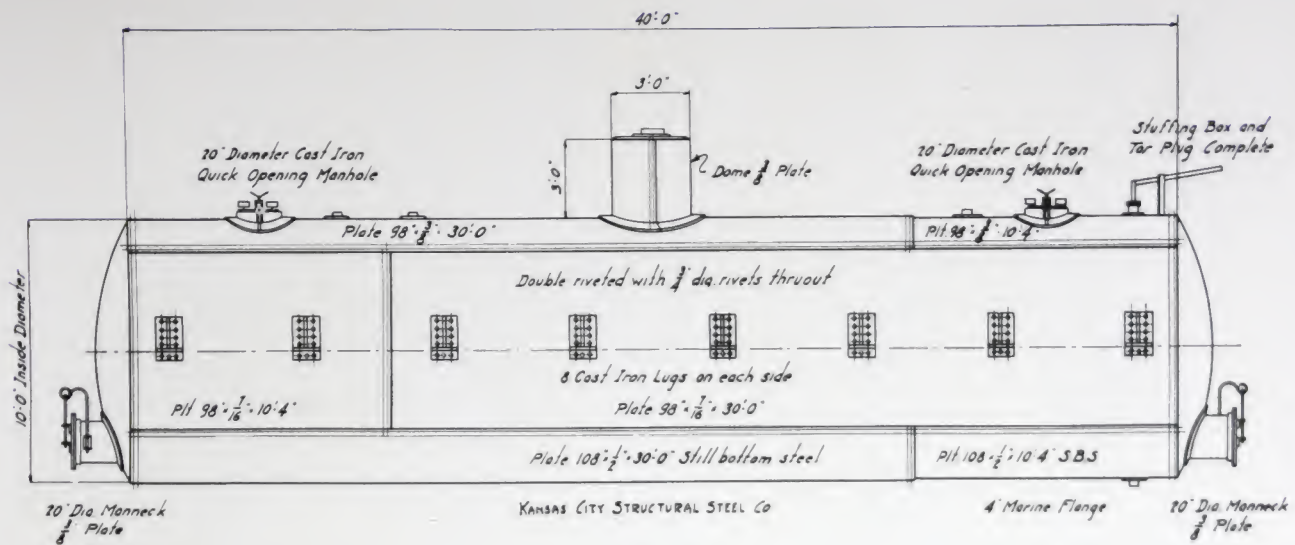
Thirty-Nine



11 x 30 Fire Still Cone Heads



Fire Still 12 ft. diameter by 30 ft. long



STANDARD FIRE STILL

10 X 40

580 Barrels Actual Capacity

SPECIFICATIONS

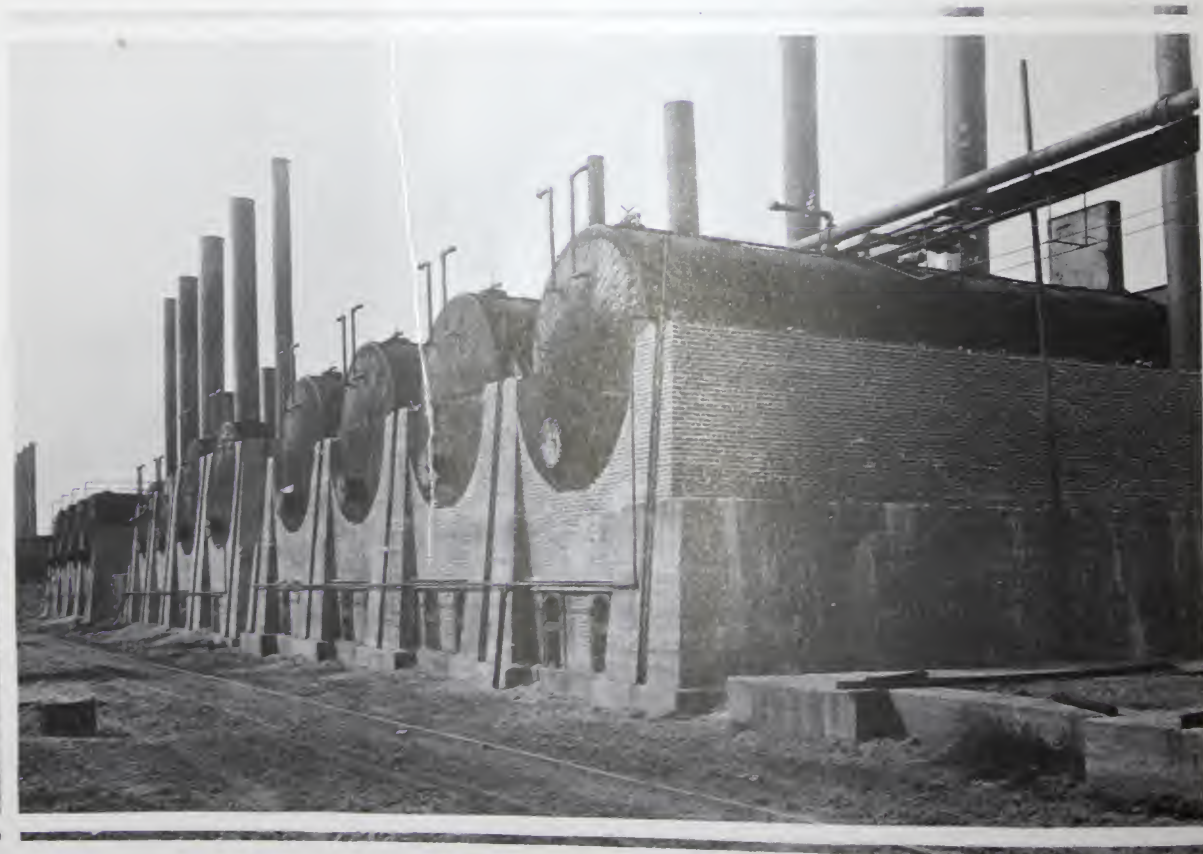
Bottom Plate (Still Bottom Steel)	108" x 1/2"
Lug Plates	7/8"
Top Plates	3/8"
One-Piece Heads	1/2" Flange Steel
Estimated Weight	36,600 lbs.

Still is riveted up complete in our shop and tested to twenty-five pounds Hydrostatic pressure, and given one coat of paint before shipping. Seams are double riveted throughout with 3/4-inch diameter rivets. Fittings include cast iron lugs, one 36-inch diameter by 36-inch high dome of 3/8-inch plate. Two 20-inch diameter cast iron quick-opening manholes complete. On either front or rear head one 20-inch diameter 3/8-inch plate manneck with bolted cover and crane. A 4-inch diameter cast iron tar plug, with stuffing box and mechanism complete. Necessary Flanges furnished and riveted on in shop as specified by customer.

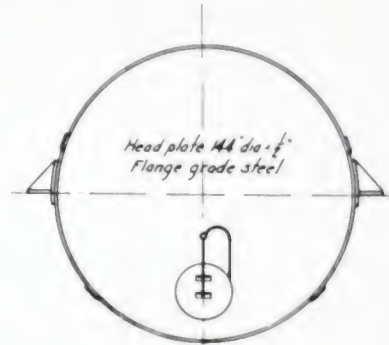
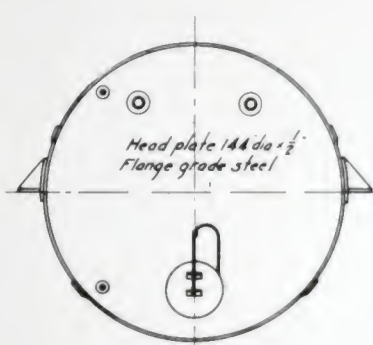
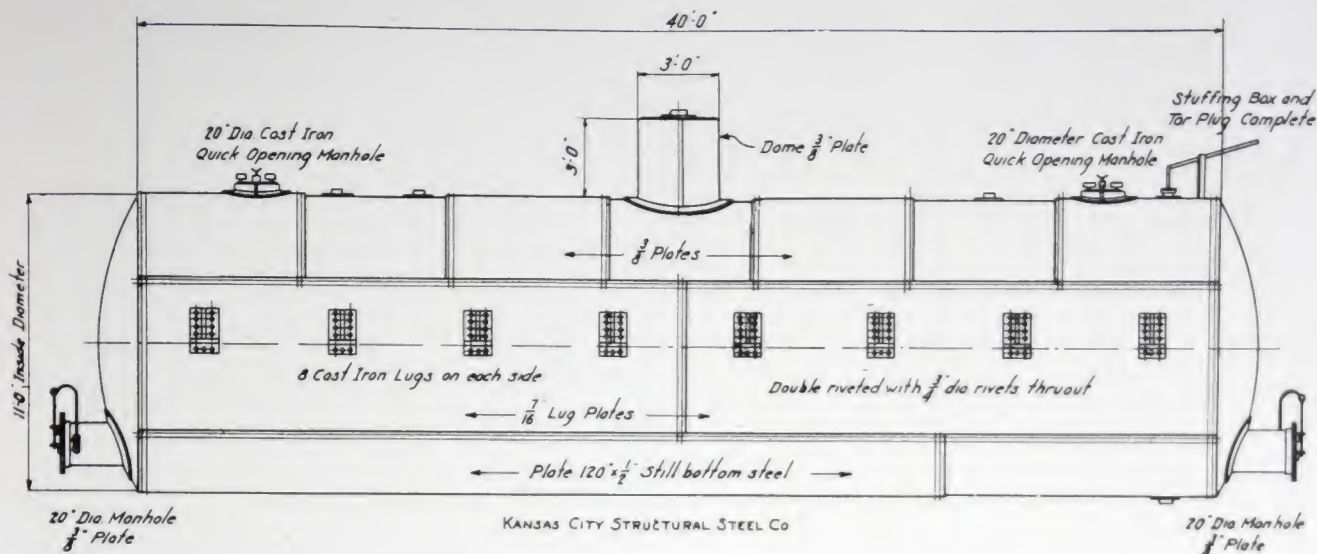
Forty-One



11-ft. x 40-ft. Still Ready for Shipment



Battery of 14-ft. x 40-ft. Stills



STANDARD FIRE STILL

11 X 40

705 Barrels Actual Capacity

SPECIFICATIONS

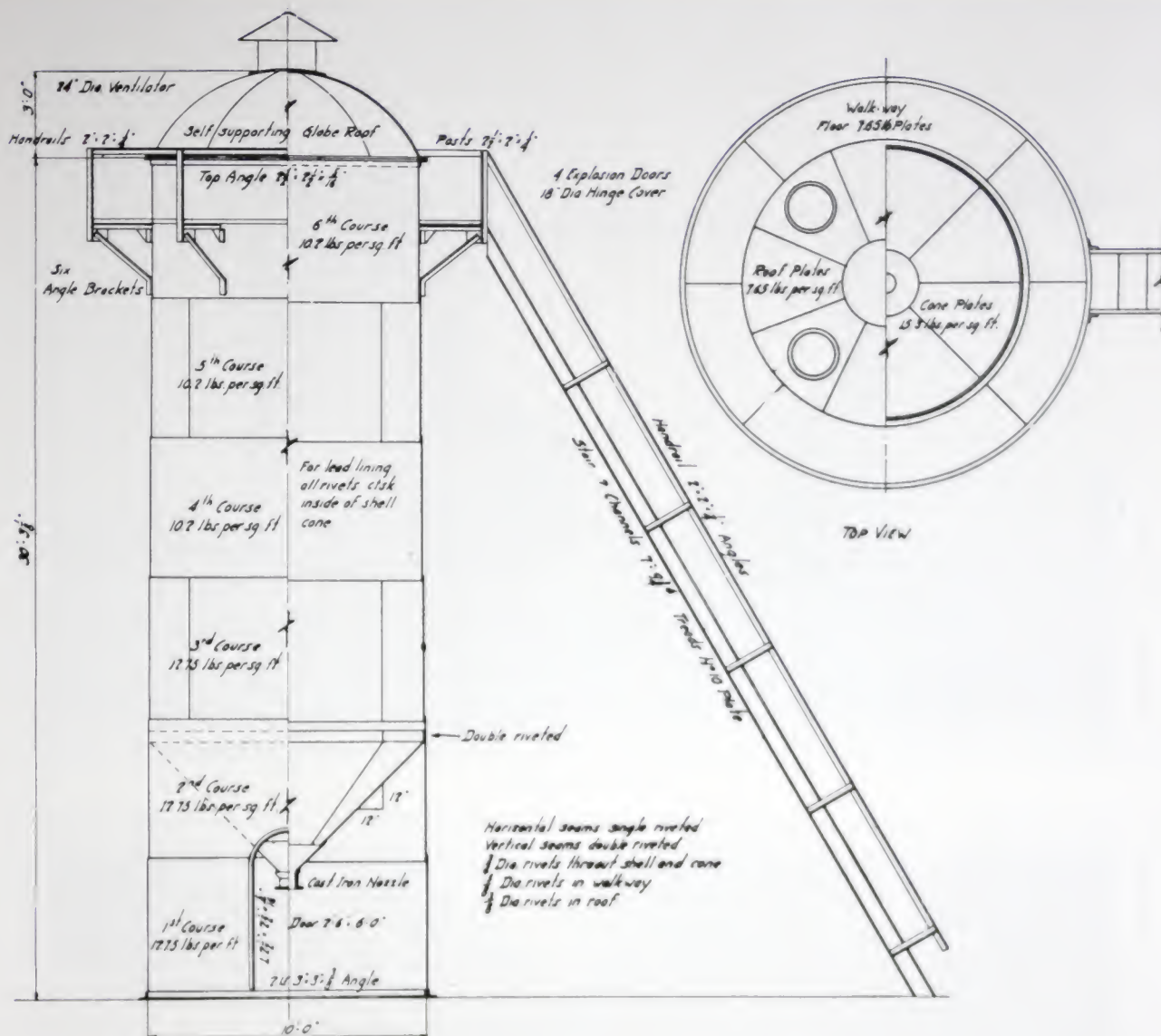
Bottom Plate (Still Bottom Steel)	120" x 1/2"
Lug Plates	7/16"
Top Plates	3/8"
One-Piece Heads	1/2" Flange Steel
Estimated Weight	40,000 lbs.

Still is riveted up complete in our shop and tested to twenty-five pounds Hydrostatic pressure, and given one coat of paint before shipping. Seams are double riveted throughout with 3/4-inch diameter rivets. Fittings include cast iron lugs, one 36-inch diameter by 36-inch high dome of 3/8-inch plate. Two 20-inch diameter cast iron quick-opening manholes complete. On either front or rear head one 20-inch diameter 3/8-inch plate manneck with bolted cover and crane. A 4-inch diameter cast iron tar plug, with stuffing box and mechanism complete. Necessary Flanges furnished and riveted on in shop as specified by costumer.

Forty-Three



Calumet and Arizona Copper Co., Douglas, Arizona



STANDARD 300 BARREL AGITATOR

10 X 30

SPECIFICATIONS

Cone Plates	15.3 lbs. sq. ft.
Bottom Angles	3" x 3" x 3/8"
1st Course Plates	12.75 lbs. sq. ft.
2nd "	12.75 "
3rd "	12.75 "
4th "	10.2 "
5th "	10.2 "
6th "	10.2 "
Top Angle	2 1/2" x 2 1/2" x 3/8"
Roof Plates	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

Diameter	10'-0"
Height	30'-3 1/8"
Capacity	294 bbls.
	12,374 gals.

ESTIMATED WEIGHT

Agitator complete	21,700 lbs
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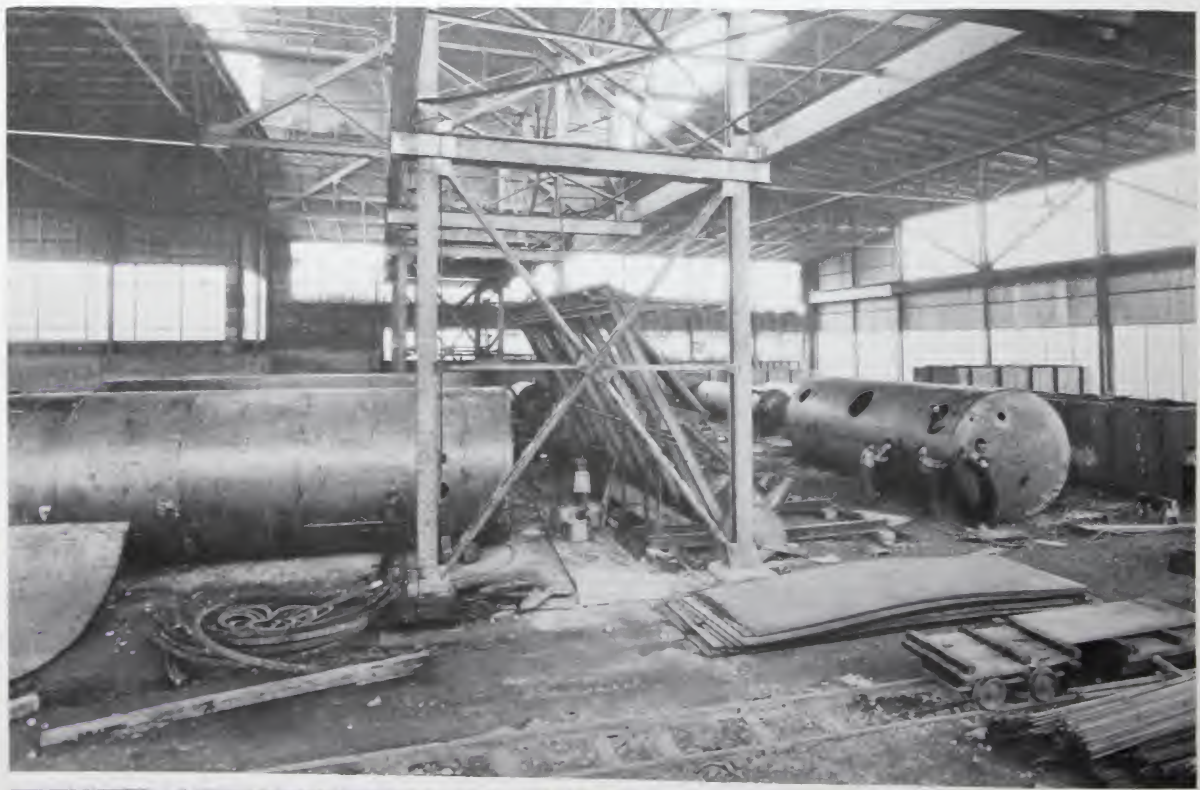
We can furnish lead lining if desired.

Riveted up complete in our shop except walkway and stairs.

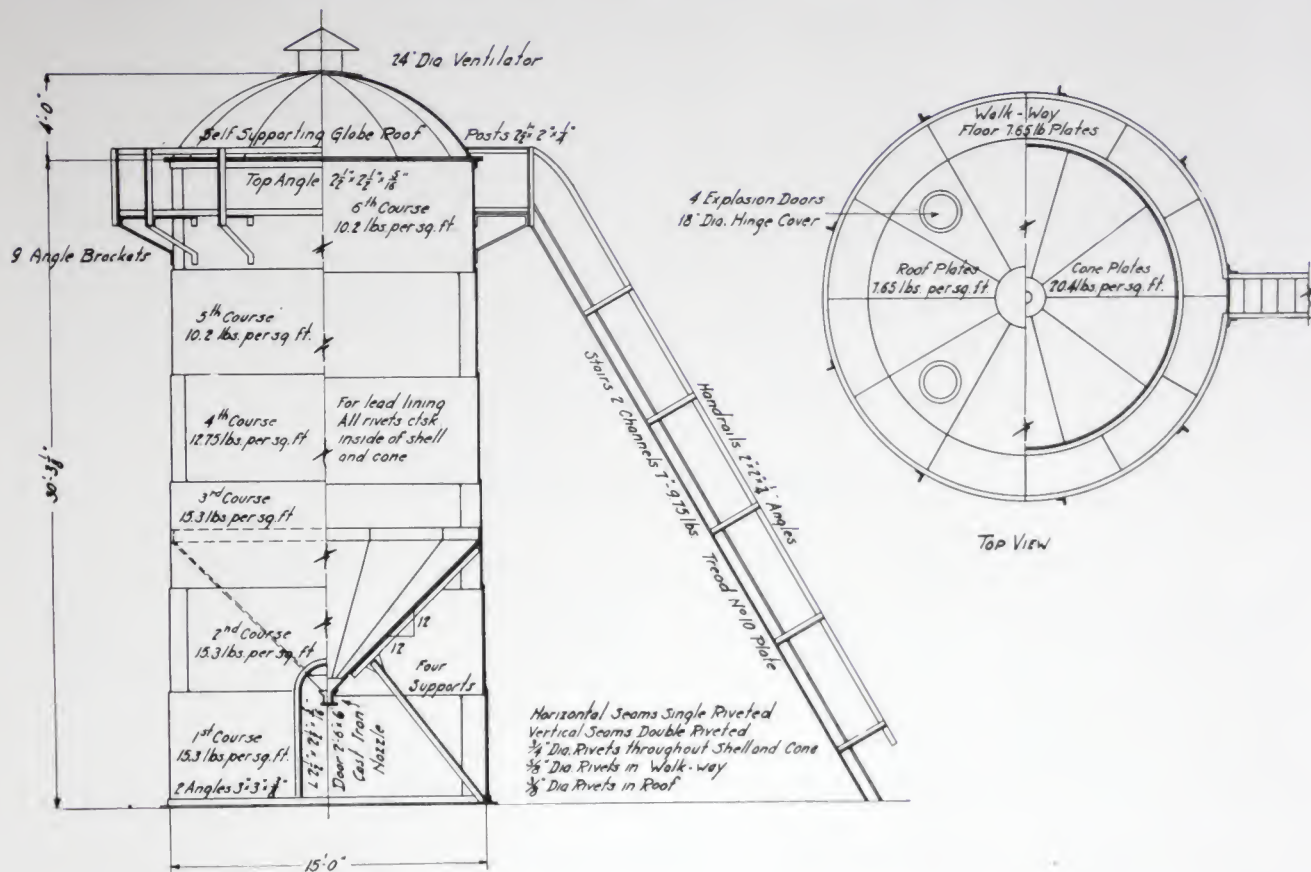
Forty-Five



2300 Barrel Agitators



Interior of Our Tank Shop



STANDARD 600 BARREL AGITATOR

15 X 30

SPECIFICATIONS

Cone Plates	20.4 lbs. sq. ft.
Bottom Angles	$3" \times 3" \times \frac{5}{16}"$
1st Course Plates	15.3 lbs. sq. ft.
2nd "	15.3 " "
3rd "	15.3 " "
4th "	12.75 " "
5th "	10.2 " "
6th "	10.2 " "
Top Angle	$2\frac{1}{2}" \times 2\frac{1}{2}" \times \frac{5}{16}"$
Roof Plates	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

Diameter	15'-0"
Height	30'-3 1/8"
Capacity	613 bbls.
	25,746 gals.

ESTIMATED WEIGHT

Agitator complete	39,000 lbs.
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We can furnish lead lining if desired.

Forty-Seven

STANDARD 230 BARREL AGITATOR

10 X 25

SPECIFICATIONS

Cone Plates.....	15.3 lbs. sq. ft.
Bottom Angles.....	3" x 3" x $\frac{3}{8}$ "
1st Course Plates.....	12.75 lbs. sq. ft.
2nd " ".....	12.75 " " "
3rd " ".....	12.75 " " "
4th " ".....	10.2 " " "
5th " ".....	10.2 " " "
Top Angle.....	2 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " x $\frac{5}{16}$ "
Roof Plates.....	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

Diameter.....	10'-0"
Height.....	25'-3 $\frac{1}{8}$ "
Capacity.....	229 bbls.
".....	9,614 gals.

ESTIMATED WEIGHT

Agitator, complete.....	19,600 lbs.
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Riveted up complete in our shop except walkway and stairs.

STANDARD 450 BARREL AGITATOR

15 X 25

SPECIFICATIONS

Cone Plates.....	20.4 lbs. sq. ft.
Bottom Angles.....	3" x 3" x $\frac{3}{8}$ "
1st Course Plates.....	15.3 lbs. sq. ft.
2nd " ".....	15.3 " " "
3rd " ".....	15.3 " " "
4th " ".....	12.75 " " "
5th " ".....	10.2 " " "
Top Angle.....	2 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " x $\frac{5}{16}$ "
Roof Plates.....	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

Diameter.....	15'-0"
Height.....	25'-3 $\frac{1}{8}$ "
Capacity.....	466 bbls
".....	19,572 gals

ESTIMATED WEIGHT

Agitator, complete.....	36,000 lbs.
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STANDARD 750 BARREL AGITATOR

15 x 35

SPECIFICATIONS

Cone Plates.....	20.4 lbs. sq. ft.
Bottom Angles.....	3" x 3" x $\frac{3}{8}$ "
1st Course Plates.....	15.3 lbs. sq. ft.
2nd " ".....	15.3 " " "
3rd " ".....	15.3 " " "
4th " ".....	12.75 " " "
5th " ".....	10.2 " " "
6th " ".....	10.2 " " "
7th " ".....	10.2 " " "
Top Angle.....	2 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " x $\frac{5}{16}$ "
Roof Plates.....	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

Diameter.....	15'-0"
Height.....	35'-3 $\frac{1}{8}$ "
Capacity.....	760 bbls.
".....	31,920 gals.

ESTIMATED WEIGHT

Agitator complete.....	42,000 lbs.
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STANDARD 1,200 BARREL AGITATOR

20 x 35

SPECIFICATIONS

Cone Plates.....	20.4 lbs. sq. ft.
Bottom Angles.....	3" x 3" x $\frac{3}{8}$ "
1st Course Plates.....	15.3 lbs. sq. ft.
2nd " ".....	15.3 " " "
3rd " ".....	15.3 " " "
4th " ".....	12.75 " " "
5th " ".....	10.2 " " "
6th " ".....	10.2 " " "
7th " ".....	10.2 " " "
Top Angle.....	2 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " x $\frac{5}{16}$ "
Roof Plates.....	7.65 lbs. sq. ft.

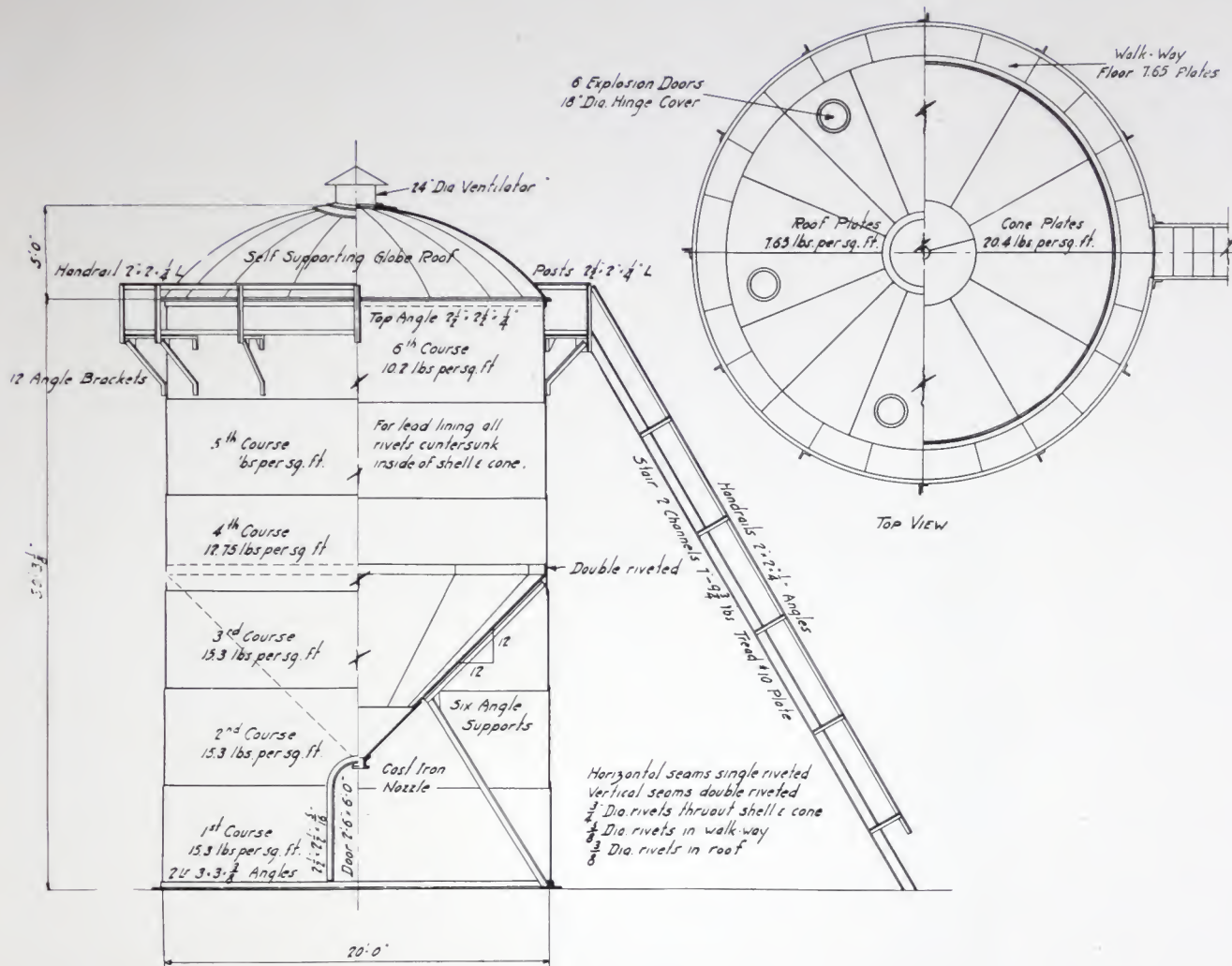
DIMENSIONS AND CAPACITY

Diameter.....	20'-0"
Height.....	35'-3 $\frac{1}{8}$ "
Capacity.....	1309 bbls.
".....	55,000 gals.

ESTIMATED WEIGHT

Agitator complete.....	57,800 lbs.
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We can furnish lead lining if desired.



STANDARD 1,000 BARREL AGITATOR

20 x 30

SPECIFICATIONS

Cone Plates	10.2 lbs. sq. ft.
Bottom Angles	3" x 3" x 3/8"
1st Course Plates	15.3 lbs. sq. ft.
2nd " "	15.3 " "
3rd " "	15.3 " "
4th " "	12.75 " "
5th " "	10.2 " "
6th " "	10.2 " "
Top Angles	2 1/2" x 2 1/2" x 5/16"
Roof Plates	7.65 lbs. sq. ft.

DIMENSIONS AND CAPACITY

Diameter	20'-0"
Height	30'-3 1/8"
Capacity	1,033 bbls.
	43,390 gals.

ESTIMATED WEIGHT

Agitator complete	54,000 lbs.
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We can furnish lead lining if desired.

Forty-Nine

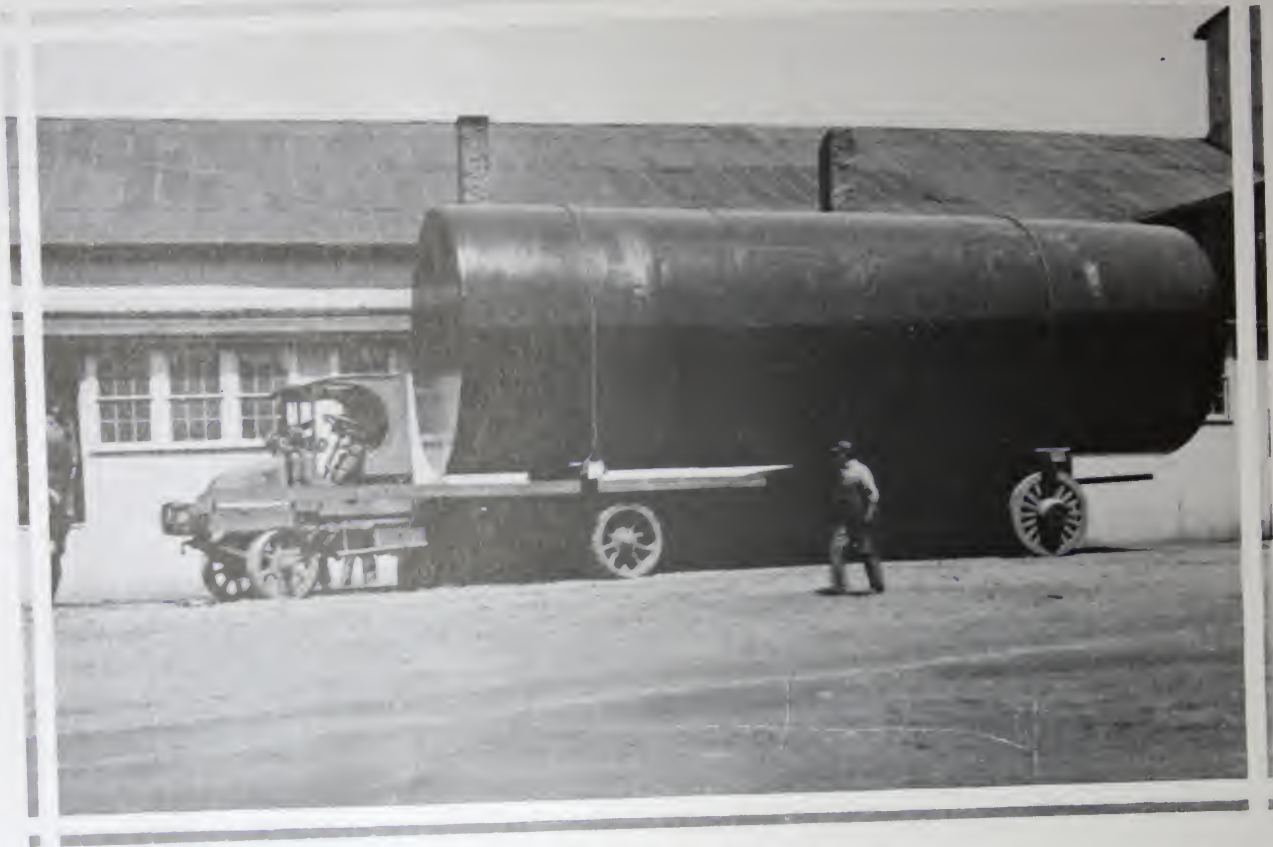


Self-Supporting Stack, 40 foot at base, 25 foot at top, 305 feet high. Calumet and Arizona Mining Co., Douglas, Arizona

Fifty

CONTRACT CONDITIONS COVERING OIL TANK AND REFINERY EQUIPMENT

1. **TERMS**—Terms of payment subject to the other provisions hereof are as follows:
60% of contract price to be paid on shipment of steel.
30% of contract price to be paid on erection ready for test.
Balance due under contract to be paid upon final completion as hereinafter provided.
For the purpose of payment in accordance with the above terms and for such purpose only, each tank or unit of equipment shall be considered as a separate contract.
2. **DELIVERY AND ACCEPTANCE OF MATERIAL**—Seller's shipment of materials hereinafter to be made from works as stated in proposal. All promises of shipment to be based upon date of receipt of complete information from Purchaser. Erection of work is to be done promptly after arrival of materials at destination.
In the event that Purchaser is not ready to receive shipment when notified that material for any tank or unit is ready for shipment, then the initial payment for such tank above provided shall become due and payable 15 days from date of such notification, and thereafter Purchaser shall be liable for the cost and expense of the moving and storing of material until Purchaser is ready to receive same.
It is understood that the date of delivery of all material and completion of work, whether expressed or implied, is subject to delays caused by common carriers, rolling mills, strikes, fires, accidents to machinery, or other causes beyond Seller's control and not due to any fault or collusion on the part of the Seller.
3. **GRADE**—Purchaser is to furnish foundation at practically ground level and keep same free from water or inundation during construction of tank; foundation to be solid, level, free from soft spots or other defects and to have five feet clearance on all sides of same for Seller to work without interference. Foundation to be of proper design and strength to support tank and its contents without failure and any expense caused Seller by defective foundation or by any failure of same to be paid to Seller by Purchaser.
4. **UNLOADING AND HAULING**—Erected prices are based on tracks and facilities being available to deliver on board cars and unload materials and equipment within three hundred feet hauling distance of tank foundation, with clear space for getting materials from cars to foundation, and clear and ample space around foundation for storing materials and carrying on erection; ground over which materials are to be hauled or conveyed to be reasonably solid and level. In lieu of any or all of these conditions, Purchaser, at the option of the Seller, will receive materials and equipment on board cars, unload, haul and deliver same alongside tank foundation and return equipment to railroad siding on board cars without cost to Seller. Erection prices are also based upon the condition that all tanks to be erected are at one location and not over three hundred feet apart.
5. **WATER**—Purchaser is to furnish free of charge to Seller, at the erection site water suitable for drinking, erection and testing purposes.
6. **DELAYS**—Purchaser is to have foundation ready by the time material arrives at destination and Seller is to be allowed to proceed with erection promptly upon arrival of material. If after material has been delivered foundations are not ready on arrival of field foreman the Purchaser is to pay the foreman's wages for such time as he is unable to proceed with erection work. In case work on any tank or unit is held up more than thirty days, through no fault of the Seller, at the end of this thirty days' period after arrival of material at the site Seller is to be paid the total contract price for such tank or unit less any payments already made and less also the amount allowed on work not begun or not completed for field erection, field overhead, erecting expenses, as estimated, traveling expenses, and per cent profit on these items, providing that if any field expenses have been incurred such expenses shall be charged against and paid by the Purchaser together with per cent profit thereon. In case erection costs increase between the time when the work would have been completed had the Seller not been delayed through no fault of his own and the time the work was actually completed, Purchaser shall pay the extra cost with its proportion of overhead and per cent profit.
7. **OVERTIME**—It is understood that the erection will be prosecuted on the basis of the normal working day or normal unit of work. Should the Seller at the request of the Purchaser work overtime, all such overtime shall be charged to the Purchaser on the basis of increased costs, including liability insurance, use of tools, superintendence, etc., plus 15%. No overtime work will be done except on the written request of the Purchaser.
8. **CAMP**—In case Seller's erection crew cannot secure suitable board and lodging convenient to site of erection at reasonable cost, Purchaser is to provide camp, board and lodging acceptable to Seller, at current rates, but not to exceed \$1.50 per day per man, or in lieu of camp, furnish transportation for the men to and from the work to a place where board and lodging acceptable to the Seller can be secured at reasonable rates.
9. **TESTING AND FINAL ACCEPTANCE**—The bottom and first ring of each tank are to be fitted up on horses, the bottom, bottom angle and first ring vertical seams to be riveted and caulked; and before lowering to the permanent foundation, the bottom and bottom angle are to be tested with water. Any leaks shall be caulked tight. This test shall be final so far as the bottom and bottom angle are concerned and a written acceptance of such work shall be immediately given by the Purchaser after the bottom is lowered. Upon notice that tank is completed, Purchaser shall supply water and fill tank with same for test at his own expense. In case Purchaser fails to fill tank within days, he shall pay to the Seller the extra expense incurred by Seller because of any further delay thereafter including expense of extra trip for tester if made necessary by such delay. Seller is to make tank water-tight and is not to be held responsible for any loss of oil or other commodity used in test by Purchaser.
In case Purchaser fails to provide for test within ten days after notice that tank is completed and ready for same, the entire amount of the contract price remaining unpaid together with charges for any extras shall forthwith become due and payable in like manner as if said tank had been duly tested and accepted, and the right to a test shall be deemed to be waived by the purchaser.



Storage Tank, 11 x 35 — Capacity 25,000 Gallons



Horizontal Riveted Storage Tank 10 x 30 Capacity 17,800 Gallons

Standard Riveted Horizontal Storage Tanks

Length of Tank	Diameter of Tank							
	7'-0"		8'-0"		9'-0"		10'-0"	
	Capacity	Weight	Capacity	Weight	Capacity	Weight	Capacity	Weight
10' 4"	2974	3200	3885	3800	4917	4400	6070	5000
15' 4"	4414	4150	5765	4900	7297	5650	9008	6400
20' 4"	5853	5100	7645	6000	9676	6900	11946	7800
25' 4"	7293	6050	9525	7100	12056	8150	14884	9200
30' 4"	8732	7000	11405	8200	14435	9400	17820	10600
35' 4"	10172	7950	13285	9300	16815	10650	20759	12000
40' 4"	11611	8900	15165	10400	19194	11900	23696	13400

HORIZONTAL TANKS

The weights given in the above table are for tanks constructed of 3/16" shells and 1/4" heads. These can also be made with 1/4" shells and this thickness is recommended for tanks having a capacity greater than 8,000 gallons.

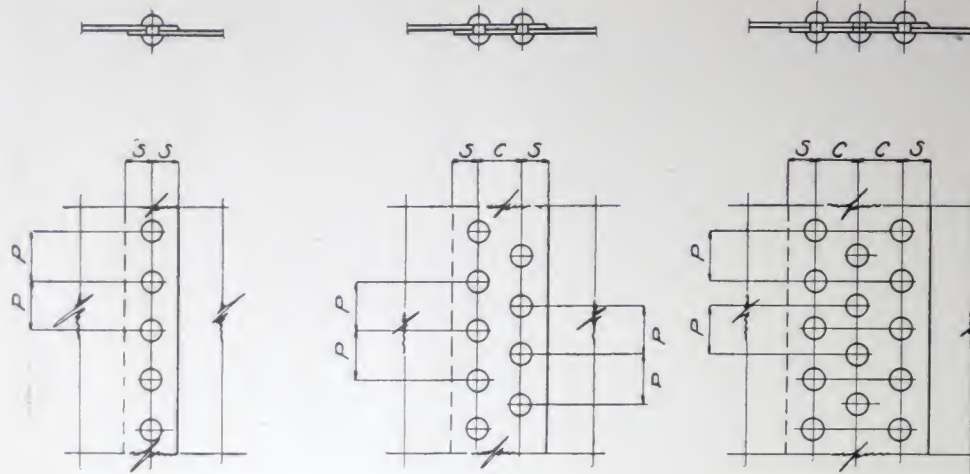
Tanks are riveted thruout with 7/16" diameter rivets driven cold. The round-about seams are single riveted, horizontal seams double riveted. All plates are bevel sheared for outside caulking.

The heads are made flat in one piece of 1/4" flange steel grade, flanged to fit shell and reinforced horizontally with one five inch I-beam.

The usual fittings furnished, unless otherwise specified, are 1—16" cast iron manhole either screw or bolt cover and 1—3" and 2—2" forged steel flanges for pipe connections.

Tanks are made up complete in our plant, hydrostatically tested, made absolutely tight and given one coat of paint before shipment.

STANDARD RIVET SPACING FOR OIL TIGHT PLATE WORK



Weight Per Sq. Ft.	Thickness of Plate	Diameter of Rivet	SINGLE			DOUBLE				TRIPLE			
			P	S		P	S	C		P	S	C	
7.65	$\frac{3}{16}$	$\frac{7}{16}$	$1\frac{1}{2}$	$\frac{3}{4}$		$1\frac{3}{4}$	$\frac{3}{4}$	$1\frac{1}{8}$					
		$\frac{1}{2}$	$1\frac{3}{4}$	$\frac{7}{8}$		2	$\frac{7}{8}$	$1\frac{1}{4}$					
8.25	6	$\frac{7}{16}$	$1\frac{1}{2}$	$\frac{3}{4}$		$1\frac{3}{4}$	$\frac{3}{4}$	$1\frac{1}{8}$					
		$\frac{1}{2}$	$1\frac{3}{4}$	$\frac{7}{8}$		2	$\frac{7}{8}$	$1\frac{1}{4}$					
10.2	$\frac{1}{4}$	$\frac{7}{16}$	$1\frac{1}{2}$	$\frac{3}{4}$		$1\frac{3}{4}$	$\frac{3}{4}$	$1\frac{1}{8}$					
		$\frac{1}{2}$	$1\frac{3}{4}$	$\frac{7}{8}$		2	$\frac{7}{8}$	$1\frac{1}{4}$					
		$\frac{5}{8}$	2	1		$2\frac{1}{4}$	1	$1\frac{1}{2}$					
		$\frac{3}{4}$	$2\frac{1}{4}$	$1\frac{1}{8}$		$2\frac{1}{2}$	$1\frac{1}{8}$	$1\frac{3}{4}$					
12.75	$\frac{5}{16}$	$\frac{5}{8}$	2	1		$2\frac{1}{4}$	1	$1\frac{1}{2}$					
		$\frac{3}{4}$	$2\frac{1}{4}$	$1\frac{1}{8}$		$2\frac{1}{2}$	$1\frac{1}{8}$	$1\frac{3}{4}$					
15.3	$\frac{3}{8}$	$\frac{5}{8}$	2	1		$2\frac{1}{4}$	1	$1\frac{1}{2}$					
		$\frac{3}{4}$	$2\frac{1}{4}$	$1\frac{1}{8}$		$2\frac{1}{2}$	$1\frac{1}{8}$	$1\frac{3}{4}$					
17.85	$\frac{7}{16}$	$\frac{3}{4}$	$2\frac{1}{4}$	$1\frac{1}{4}$		$2\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{3}{4}$		3	$1\frac{1}{4}$	$1\frac{7}{8}$	
		$\frac{7}{8}$	$2\frac{1}{2}$	$1\frac{3}{8}$		3	$1\frac{3}{8}$	2		$3\frac{1}{2}$	$1\frac{3}{8}$	$2\frac{1}{4}$	
20.4	$\frac{1}{2}$	$\frac{3}{4}$	$2\frac{1}{4}$	$1\frac{1}{4}$		$2\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{3}{4}$		3	$1\frac{1}{4}$	$1\frac{7}{8}$	
		$\frac{7}{8}$	$2\frac{1}{2}$	$1\frac{1}{2}$		3	$1\frac{1}{2}$	2		$3\frac{1}{2}$	$1\frac{1}{2}$	$2\frac{1}{4}$	

Standard Riveted Vertical Storage Tanks

Capacity Gallons	Size		Approximate Weight Pounds
	Diameter	Height	
6022	10' 0''	10' 0''	4700
8960	10' 0''	15' 0''	6100
11897	10' 0''	20' 0''	7500
14834	10' 0''	25' 0''	8900

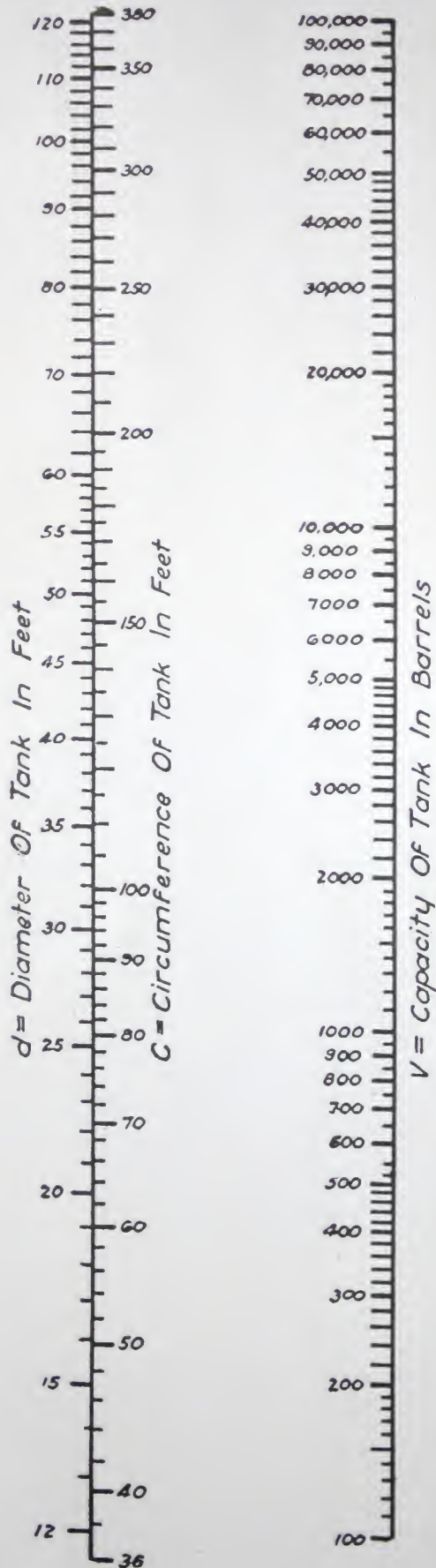
VERTICAL TANKS

Our vertical tanks are constructed of heavier material than is generally found in tanks of this type as we use 3/16" plate thruout for the shell and roof. The bottom is made of 1/4" flange grade steel in one piece flanged to fit shell.

Tanks are riveted thruout with 7/16" diameter rivets driven cold. The round-about seams are single riveted, vertical seams double riveted. All plates are bevel sheared for outside caulking. The usual fittings furnished unless otherwise specified are one 16" cast iron manhole either screw or bolt cover, one 2" vent and two 2" forged steel flanges for pipe connections.

Tanks are riveted up complete in the shop, hydrostatically tested, made absolutely tight and given one coat of paint before shipment.

CAPACITY OF TANKS



Directions

Lay a straight edge across diagram in any position that will cut all three scales.

The scale readings at the three points of intersection satisfy the equations

$$V = 0.1399 d^2 h$$

and

$$V = 0.01417 C^2 h$$

V = Capacity of tank in bbls.

d = Diameter of tank in feet.

h = Height of tank in feet.

C = Circumference of tank in feet.

For values of h less than 5 multiply h by 10 and divide the resulting V by 10.

For values of d less than 12 multiply d by 10 and divide the resulting V by 100.

For values of both h and d less than 5 and 12 respectively, multiply each by 10 and divide the resulting V by 1000.

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By

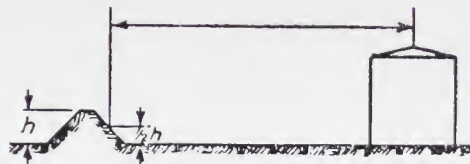
O'NEILL, MOLTZ & HEAVNER

Insurance Engineers

Tulsa, Oklahoma New York City.

STANDARD DIKE DIMENSIONS

To Obtain Maximum Fire Insurance Credits



Space within Dike to be kept clear of grass, weeds, oil and rubbish

Directions

Lay a straight edge across diagram in any position that will cut all three scales.

The scale readings at the three points of intersection satisfy the equation

$$V = 0.5595r^2h$$

for masonry dikes, and the equation

$$V = 0.373r^2h$$

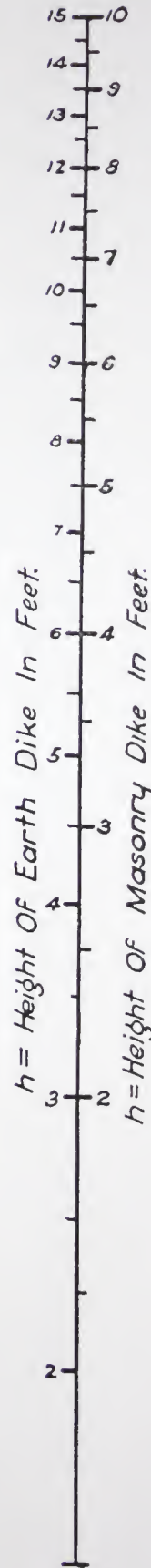
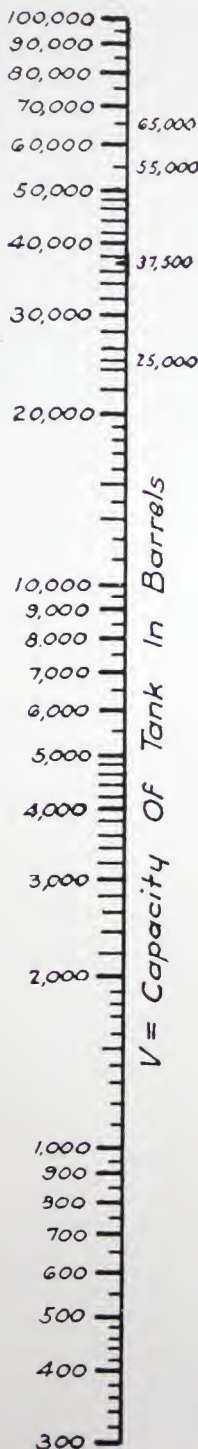
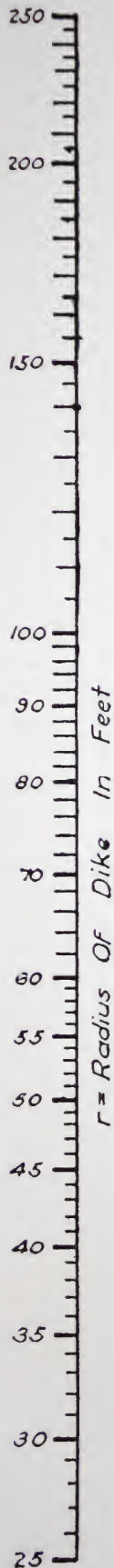
for earth dikes.

V = Capacity of tank in bbls.

r = Radius of dike in feet.

h = Height of dike in feet.

This gives a dike capacity equal to that of tank for masonry dikes and $1\frac{1}{2}$ times that of tank for earth dikes. This complies with insurance requirements.



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By:

O'NEILL, MOLTZ & HEAVNER

Insurance Engineers

Tulsa, Oklahoma. New York City.

WEIGHTS OF SHEETS AND PLATES

Estimated weight by standard gauges

No. of Gauge or Thickness of Sheet	Approximate Thickness in Inches				Weight per Square Foot in Pounds					
	U. S. Standard adopted by U. S. Government July 1, 1893		Stubbs' or Birmingham Wire Gauge	American or Brown & Sharp's	U. S. Standard	Mills Standard	Birmingham Wire Gauge		American or Brown & Sharpe's	
	Fractions	Decimals	Decimals	Decimals	Steel	Steel	Steel	Iron	Steel	Iron
7-0's	1/2	.5			20.00	20.4				
6-0's	15/32	.468			18.75	19.125				
5-0's	7/16	.437			17.50	17.85				
0000	13/32	.406	.454	.46	16.25	16.575	18.46	18.22	18.77	18.40
000	3/8	.375	.425	.409	15.	15.30	17.28	17.05	16.71	16.38
00	11/32	.343	.38	.364	13.75	14.025	15.45	15.25	14.88	14.59
0	5/16	.312	.34	.324	12.50	12.75	13.82	13.64	13.26	13.00
1	9/32	.281	.30	.289	11.25	11.475	12.20	12.04	11.80	11.57
2	17/64	.265	.284	.257	10.625	10.8375	11.55	11.40	10.51	10.30
3	1/4	.25	.259	.229	10.	10.2	10.53	10.39	9.36	9.18
4	15/64	.234	.238	.204	9.375	9.5625	9.68	9.55	8.34	8.17
5	7/32	.218	.22	.181	8.75	8.925	8.95	8.83	7.42	7.28
6	13/64	.203	.203	.162	8.125	8.2875	8.25	8.15	6.61	6.48
7	3/16	.187	.18	.144	7.5	7.65	7.32	7.22	5.89	5.77
8	11/64	.171	.165	.128	6.875	7.0125	6.71	6.62	5.24	5.14
9	5/32	.156	.148	.114	6.25	6.375	6.02	5.94	4.67	4.58
10	9/64	.140	.134	.101	5.625	5.7375	5.45	5.38	4.16	4.08
11	1/8	.125	.12	.09	5.	5.1	4.88	4.82	3.70	3.63
12	7/64	.109	.109	.08	4.375	4.625	4.43	4.37	3.30	3.23
13	3/32	.093	.095	.072	3.75	3.825	3.86	3.81	2.94	2.88
14	5/64	.078	.083	.064	3.125	3.1875	3.37	3.33	2.62	2.56
15	9/128	.070	.072	.057	2.8125	2.86875	2.93	2.89	2.33	2.28
16	1/16	.062	.065	.05	2.5	2.55	2.64	2.61	2.07	2.03
17	9/160	.056	.058	.045	2.25	2.295	2.36	2.33	1.85	1.81
18	1/20	.05	.049	.04	2.	2.04	1.99	1.97	1.64	1.61
19	7/160	.043	.042	.035	1.75	1.785	1.71	1.69	1.46	1.44
20	3/80	.037	.035	.032	1.50	1.53	1.42	1.40	1.31	1.28
21	11/320	.034	.032	.028	1.375	1.4025	1.30	1.28	1.16	1.14
22	1/32	.031	.028	.025	1.25	1.275	1.14	1.12	1.03	1.01
23	9/320	.028	.025	.022	1.125	1.1475	1.02	1.00	.922	.904
24	1/40	.025	.022	.020	1.	1.02	.895	.883	.82	.804
25	7/320	.021	.02	.017	.875	.8925	.813	.803	.73	.716
26	3/160	.018	.018	.015	.75	.765	.732	.722	.649	.636
27	11/640	.017	.016	.014	.6875	.70125	.651	.642	.579	.568
28	1/64	.015	.014	.012	.625	.6375	.569	.562	.514	.504
29	9/640	.014	.013	.011	.5625	.57375			.461	.452
30	1/80	.012	.012	.01	.5	.51			.408	.46
31	7/640	.010	.01	.008	.4375	.44625			.363	.356
32	13/1280	.010	.009	.008	.4062	.414375			.326	.320
33	3/320	.009	.008	.007	.375	.3825			.29	.284
34	11/1280	.008	.007	.006	.3437	.350625			.257	.252
35	5/640	.007	.005	.005	.3125	.31885			.228	.224
36	9/1280	.007	.004		.2812	.286875				
37	17/2560	.006			.2656	.2709375				
38	1/160	.006			.25	.255				

The United States Gauge, the one commonly used in the United States, is a weight gauge based upon the weights per square foot in ounces avoirdupois and approximate thickness based upon 480 pounds per cubic foot.

In the practical use and application of the United States Standard Gauge, a weight variation of 2 1-2 per cent. either way may be allowed.

U. S. GALLONS IN ROUND TANKS

For One Foot in Depth

Diameter of Tanks		No. U. S. Gallons	Cu. Ft. and Area in Sq. Ft.	Diameter of Tanks		No. U. S. Gallons	Cu. Ft. and Area in Sq. Ft.	Diameter of Tanks		No. U. S. Gallons	Cu. Ft. and Area in Sq. Ft.
Ft.	In.			Ft.	In.			Ft.	In.		
1		5.87	.785	5	8	188.66	25.22	19		2,120.90	283.53
1	1	6.89	.922	5	9	194.25	25.97	19	3	2,177.10	291.04
1	2	8.	1.069	5	10	199.92	26.73	19	6	2,234.	298.65
1	3	9.18	1.227	5	11	205.67	27.49	19	9	2,291.70	306.35
1	4	10.44	1.396	6		211.51	28.27	20		2,350.10	314.16
1	5	11.79	1.576	6	3	229.50	30.68	20	3	2,409.20	322.06
1	6	13.22	1.767	6	6	248.23	33.18	20	6	2,469.10	330.06
1	7	14.73	1.969	6	9	267.69	35.78	20	9	2,529.60	338.16
1	8	16.32	2.182	7		287.88	38.48	21		2,591.	346.36
1	9	17.99	2.405	7	3	308.81	41.28	21	3	2,653.	354.66
1	10	19.75	2.640	7	6	330.48	44.18	21	6	2,715.80	363.05
1	11	21.58	2.885	7	9	352.88	47.17	21	9	2,779.30	371.54
2		23.50	3.142	8		376.01	50.27	22		2,843.60	380.13
2	1	25.50	3.409	8	3	399.88	53.46	22	3	2,908.60	388.82
2	2	27.58	3.687	8	6	424.48	56.75	22	6	2,974.30	397.61
2	3	29.74	3.976	8	9	449.82	60.13	22	9	3,040.80	406.49
2	4	31.99	4.276	9		475.89	63.62	23		3,108.	415.48
2	5	34.31	4.587	9	3	502.70	67.20	23	3	3,175.90	424.56
2	6	36.72	4.909	9	6	530.24	70.88	23	6	3,244.60	433.74
2	7	39.21	5.241	9	9	558.51	74.66	23	9	3,314.	443.01
2	8	41.78	5.585	10		587.52	78.54	24		3,384.10	452.39
2	9	44.43	5.940	10	3	617.26	82.52	24	3	3,455.	461.86
2	10	47.16	6.305	10	6	640.74	86.59	24	6	3,526.60	471.44
2	11	49.98	6.681	10	9	678.95	90.76	24	9	3,598.90	481.11
3		52.88	7.069	11		710.90	95.03	25		3,672.	490.87
3	1	55.86	7.467	11	3	743.58	99.40	25	3	3,745.80	500.74
3	2	58.92	7.876	11	6	776.99	103.87	25	6	3,820.30	510.71
3	3	62.06	8.296	11	9	811.14	108.43	25	9	3,895.60	520.77
3	4	65.28	8.727	12		846.03	113.10	26		3,971.60	530.93
3	5	68.58	9.168	12	3	881.65	117.86	26	3	4,048.40	541.19
3	6	71.97	9.621	12	6	918.	122.72	26	6	4,125.90	551.55
3	7	75.44	10.085	12	9	955.09	127.68	26	9	4,204.10	562.
3	8	78.99	10.559	13		992.91	132.73	27		4,283.	572.66
3	9	82.62	11.045	13	3	1,031.50	137.89	27	3	4,362.70	583.21
3	10	86.33	11.541	13	6	1,070.80	143.14	27	6	4,443.10	593.96
3	11	90.13	12.048	13	9	1,110.80	148.49	27	9	4,524.30	604.81
4		94.	12.566	14		1,151.50	153.94	28		4,606.20	615.75
4	1	97.96	13.095	14	3	1,193.	159.48	28	3	4,688.80	626.80
4	2	102.	13.635	14	6	1,235.30	165.13	28	6	4,772.10	637.94
4	3	106.12	14.186	14	9	1,278.20	170.87	28	9	4,856.20	649.18
4	4	110.32	14.748	15		1,321.90	176.71	29		4,941.	660.52
4	5	114.61	15.321	15	3	1,366.40	182.65	29	3	5,026.60	671.96
4	6	118.97	15.90	15	6	1,411.50	188.69	29	6	5,112.90	683.49
4	7	123.42	16.50	15	9	1,457.40	194.83	29	9	5,199.90	695.13
4	8	127.95	17.10	16		1,504.10	201.06	30		5,287.70	706.86
4	9	132.56	17.72	16	3	1,551.40	207.39	30	3	5,376.20	718.69
4	10	137.25	18.35	16	6	1,599.50	213.82	30	6	5,465.40	730.62
4	11	142.02	18.99	16	9	1,648.40	220.35	30	9	5,555.40	742.64
5		146.88	19.63	17		1,697.90	226.98	31		5,646.10	754.77
5	1	151.82	20.29	17	3	1,748.20	233.71	31	3	5,737.50	766.99
5	2	156.83	20.97	17	6	1,799.30	240.53	31	6	5,829.70	779.31
5	3	161.93	21.65	17	9	1,851.10	247.45	31	9	5,922.60	791.73
5	4	167.12	22.34	18		1,903.60	254.47	32		6,016.20	804.25
5	5	172.38	23.04	18	3	1,956.80	261.59	32	3	6,110.60	816.86
5	6	177.72	23.76	18	6	2,010.80	268.80	32	6	6,205.70	829.58
5	7	183.15	24.48	18	9	2,065.50	276.12	32	9	6,301.50	842.39

42 Gallons equal 1 Barrel

To find the capacity of tanks greater than the largest given in the table, look in the table for a tank of one-half of the given size and multiply its capacity by 4 or one of one-third its size and multiply its capacity by 9, etc.

LOSSES IN THE STORAGE OF CRUDE PETROLEUM

From

Bulletin Number 15 of Kansas City Testing Laboratory, By Dr. Roy Cross

The principal losses in the storage of crude petroleum are due to evaporation, to fire and to seepage.

Oils having the greatest loss are the crude oils containing the most gasoline, since they are the most volatile, most readily form explosive and inflammable mixtures and due to their low viscosity most readily flow through walls of loose texture.

The loss from evaporation is greater the larger the amount of gasoline. The loss also depends upon the temperatures of storage, and upon the amount of surface exposed to the atmospheric circulation. If the tank or container is perfectly tight, then there will be no loss by evaporation.

There are three general types of storage now in use in the Mid-Continent fields: the earthen reservoir, the steel tank with wooden roof and the steel tank with a steel gas-tight roof.

The 55,000 and 35,000 barrel steel tanks are the usual sizes. Altogether there are more than 3,500 of these large steel tanks in use in the Mid-Continent field.

The earthen storage is extremely wasteful from both seepage and evaporation. Petroleum standing in this type of reservoir has been known to shrink 40% in volume in two or three weeks. The shrinkage in value is of course much greater as the portion lost by evaporation is the best of the gasoline.

The following losses by evaporation took place in steel tanks with no seepage, with wooden roof covered with paper and tarred and apparently tight. The oil was of forty degree Be' gravity and the tanks were of a diameter of 114½ feet.

CAPACITY	LOSS IN GAUGE	ACTUAL LOSS	PERIOD	PER CENT LOSS
55,000 bbls.	1 ft. 1 3/4 in.	2,101 bbls.	5 mos.	4.2
55,000 bbls.	1 ft. 2 5/8 in.	2,235 bbls.	4½ mos.	4.6
55,000 bbls.	11 1/8 in.	1,700 bbls.	3½ mos.	3.4
55,000 bbls.	1 ft. 1/2 in.	1,910 bbls.	3¼ mos.	3.8

The above figures indicate that there might be a loss of 1% per month of storage in wood roof steel tanks and this might amount to as much as 6,000 barrels per year per tank.

It has been claimed that oil stored in white tanks is subjected to 1 to 1½% less evaporation than in red tanks and 2½% less evaporation than in black tanks.

Various types of insulation have been used with success.

A typical storage temperature for the Mid-Continent field for oil stored above ground would be eighty degrees F. which would more nearly approach the storage temperature of the air for the whole year.

If tanks could be successfully and cheaply built in the ground, they would have the advantage of almost perfect insulation from outside heat, and the oil would be stored at practically the temperature at which it comes from the ground. For this submerged type of tank, concrete construction would be proper if capable of perfect construction. It should be monolithic, well reinforced and lined with a coating impervious to water and gasoline.

Next in quantity after the evaporation losses in the storage of crude oil is the loss due to fire. Petroleum fires destroyed 12,850,000 barrels of oil in the United States in 1918. From January 1, 1908 to January 1, 1918, approximately 12,850,000 barrels of oil and 5,024,506,000 cubic feet of gas were destroyed by fire in the United States entailing a total estimated property loss of \$25,254,000. During this period 503 fires were reported. Of these fires 310 were caused by lightning and 193 by other causes. The losses from the fires caused by lightning were estimated to be \$11,148,000 and from those due to other causes, \$14,106,200. Directly and indirectly the fires resulted in the deaths of nearly 150 persons and were responsible for almost as many more being permanently disabled.

Loss from fire in the oilfield storage in the year 1916 amounted to about \$4,000,000.

The causes of fires are electrical discharges or open flames in the presence of an inflammable or explosive mixture of gasoline and air. The amount of gasoline vapor in air necessary for an explosive mixture is within the limits of $1\frac{1}{2}\%$ and 5% by weight. Less than the lower limit or more than the upper limit will not ignite. In an open tank if the amount at the surface of the oil exceeds $1\frac{1}{2}\%$ there is at some point an explosive mixture and an igniting temperature of nine hundred degrees F. or over will cause it to take fire. In a perfectly tight tank with gasoline vapor in excess of the upper limit for an explosive mixture, there will be no fire unless the roof of the tank is open at some point.

The ingress of a flame through an opening may be prevented in the same way that the flame in the Davy miner's lamp is prevented from passing outward. This operates by having some metal screen or other material cool the flame and prevent it being propagated into the tank. This will not prevent ignition from an electrostatic discharge in the vapor space of the tank.

Methods for prevention of fires of oil in storage are as follows:

1st. Means of preventing the passage of the spark in a portion of the unfilled face of the tank.

2nd. The maintenance of a mixture in the unfilled portion of the tank which is not an explosive mixture.

3rd. A tank so placed and constructed that the cooling effect of the walls will tend to smother the flames and the ingress of air will be so arranged that the fire is not readily fed.

4th. A means for quickly eradicating the fire after it is ignited.

Several more or less successful methods for extinction of oil tank fires have been in use. The best involves the use of mixtures of sodium bicarbonate and sulphuric acid which produce sufficient carbon dioxide to smother the flame. If some sort of saponifying agent is used the carbon dioxide will make a froth which will float on the surface of the oil and is very effective in extinguishing the flame.

The application of steam is very effective but in the storage of a very large amount of oil the steam is not always available when needed and at the point where needed.

For small oil fires, dust or other finely divided mineral matter is effective in extinguishing the fire.

PROTECTION AGAINST FIRE AND EVAPORATION

From the foregoing article, it can be readily seen that every precaution should be taken to lessen the great losses by evaporation and fire.

The all steel tank with 3/16" roof caulked gas tight and properly vented is rapidly being recognized as the solution for fire prevention. It has been proven that the majority of fires are caused by lightning striking tanks which in most cases are of the wood roof type, the construction of which renders it impossible to make gas tight. The contents of the tank do not attract the lightning. It is the gases that saturate the space between the surface of the oil and the roof and because of the roof not being tight, these gases escape through crevices and are easily ignited.

On large tank farms, steel roof tanks have been known to burn due to the fire having spread from wood roof tanks but they have never been known to be the original source of the fire.

Although the initial cost of the all steel roof is more than for the wood roof, the additional cost is insignificant as compared with the saving effected from evaporation losses alone. In addition the tank and contents will enjoy a much lower rate of insurance and this saving within a very short period will more than cover the difference in cost. Too, the fact that the fire hazard with this form of construction is reduced to a minimum will afford considerable satisfaction.

TANK FOUNDATION AND DIKE

It is important in preparing the foundation that same is absolutely level and of uniform and solid soil. Otherwise the tank will settle unevenly and have a tendency to break the caulking. This naturally causes leaks to develop in both shell and bottom. Uneven settlement of the column will cause the roof to buckle or sag and pull away from the shell exposing the contents to the elements.

Partially filled grades should not be used but in cases where the site selected is on a hill side and cannot be avoided, the filled soil should be well tamped. After tamping, the fill should be two or three inches higher than the solid portion. This will allow for further settlement after the tank is filled and will result in a level grade.

Where the soil is either rocky or extremely moist, this situation may be overcome by covering the grade with a layer of oiled sand several inches in thickness or the moist soil itself can be oiled and the oil worked in several inches by means of raking.

Cinders should not be used as the acid contained therein is detrimental, the chemical action having a deteriorating tendency on the bottom which is constructed of light steel plates.

It is essential to keep the grades free from water especially after testing. It is advisable to pump the water outside the dike.

The common practice to insure the bottom from deterioration is to paint same before lowering with tar, asphalt or some good rust resisting paint. The size of the dike required depends entirely upon the condition of the tank side. Regarding size necessary in order to obtain maximum insurance credits, see table on page 57.

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